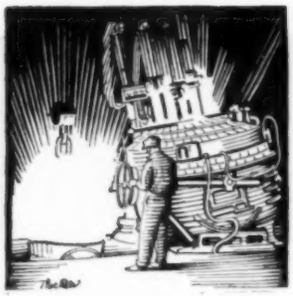


The Foundry

for June

If The Graduate Made a Speech

JUNE is commencement time. Millions of youngsters, sobered by the weight of four depression years, listen to thousands of graduation addresses. The themes of these will vary, but all of the speakers will give advice, some flattery and a few parade their own success, a goal for striving, but unattainable by those who come behind. We all know the types. Suppose instead of public men, the graduate could speak.

What would he say to you, Mr. Foundryman? Would he judge your teamwork with your competitor in the industry you serve as sporting? How would he grade your attention to your tasks, your study of the problems of business today? What excuse would he accept for chiseling price cutting under the honor standards of our schools and colleges?

And how about your attitude as employer toward this year's crop of graduates? Few who emerge from the classic halls this year are starry eyed idealists. Most of them, through direct hardship or the reflex of curtailed family budgets, have learned values. They ask to be judged by future performance and not by example of some educated idler who scorned the shovel in the past and vaunted a diploma as permanent work relief.

Nor would the 1936 graduate take pride in the discredit that a few headline hunting professors have brought on colleges by their pink proclivities. The undergraduate will listen to political argument and perhaps indulge a bit. He may seem deadly serious in advocating a bonus for future soldiers yet unborn. But the toughest group for any radical windbag to face is that made up of students. They can smell a fake.

If this young graduate addressed you, after talking with your workmen, superintendents, salesmen, what would he say? Would he gain from them a picture of success? How would he measure your leadership by the men who work for you? Would he confer upon you a degree of confidence by signing his name upon your payroll? What are you doing to merit his approval of your industry and your plant?

The Voice of Steel

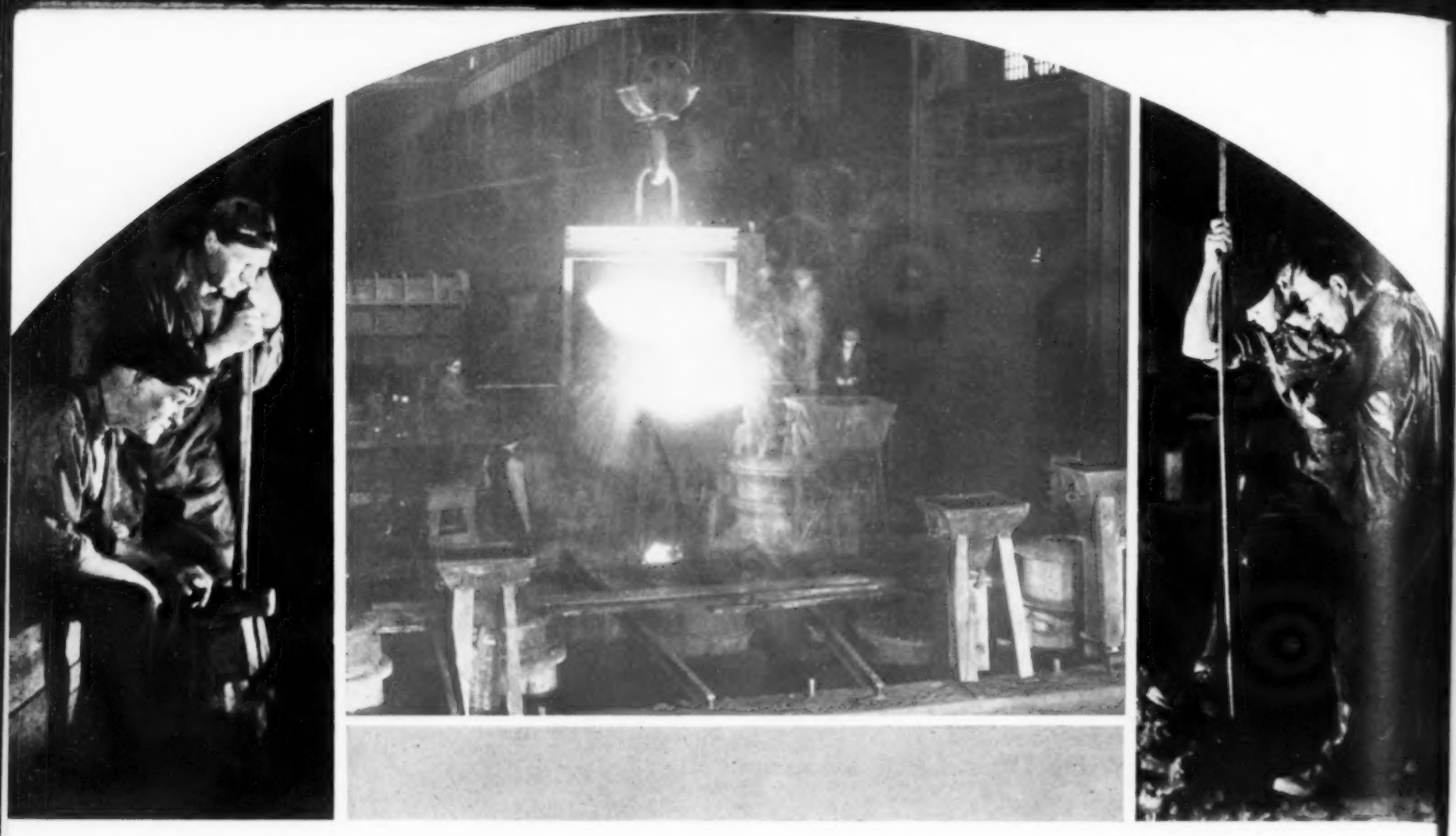
RECENT statements by leaders at the Iron and Steel institute meeting in New York emphasize economic and technical trends. With production at the rate of 75 per cent of the all time annual record, 100 per cent employment, high wage levels and low earnings, higher prices are forecast. A commercial rule advocated that every transaction shall yield the value of the product to the producer. Rising taxes and government hampering of business were assailed. So much for the business trends.

Along technical lines, the growth in production and service of alloy steel, advancement in metallurgy and improvements in furnace practice were outlined.

A further subject of vital interest to all ferrous foundrymen was presented in a thorough study of the scrap situation presented by Clyde E. Williams, Battelle Memorial Institute, Columbus, O. Larger exports of scrap, the increase from automotive sources of lighter grades that are viewed skeptically by foundrymen, the increasing content of alloying elements that are sometimes harmful and advancing scrap prices, all have a bearing on the future use of large scrap percentages in cupolas, air furnaces and open hearths. Greater than all these is the steady increased steel melting requirement. This means more pig in the mix.

Viewed from the foundry gallery, the whole scene of the steel meeting from the business and technical angle spells, HIGHER PRICES FOR CASTINGS.

Editor



INDUSTRY'S OWN VISION AND DESIRE PROVIDE SOCIAL ADVANCES

By W. J. CAMERON
Ford Motor Co., Detroit

Presented before Members and Guests of the American Foundrymen's Association at its Annual Banquet, Fortieth Annual Convention, Detroit, May 7, 1936.

IN THE time we have it would be impossible fully to assess the value to the world of your special work. As an industry, of course, your work ranks amongst the most ancient. As an art it is sister to the major arts and mother of many lesser ones. And as a science it marches in the van. There is no work of human hands or brain that can dispense entirely with your service. And just because your relations are universal, I feel justified in discussing some interests you hold in common with all other business and industry. I do not mean that we shall discuss politics. Not but that we have the right do. Politics is certainly not backward about discussing business. But to workers in metals for a thousand years, parties and policies and popular personalities are but passing things. They come and they go. A more vital interest, deeper than politics, is the general social advance which it has been industry's privilege from the beginning to help.

One peculiarity of the time is the propaganda which assumes that the only persons interested in furthering social progress are the temporary occupants of public office. These gentlemen, it would seem, inhabit a higher unselfish world from which they drop down the blessings of reform on this under-world oppressed by industry —industry the meanwhile, so the fiction goes, gnashing its teeth and lashing its forked tail whenever a blessing threatens to land.

Industry Always an Important Factor

That is a curiously distorted view of the world. If your ancient craft of the foundry could speak and tell the story of a hundred generations, it would recite a different tale. It would tell that of the four major influences of social life—Religion, the Family, Nationality and Industry—industry bears a generous ratio with the rest in the furtherance of human welfare.

Not a social proposal is made today but what requires, even commands, that industry be its chief supporter. The government itself recog-

nizes industry as the basis on which the social-economic structure rests. Propose a law for social betterment and industry somehow must be hooked up with the legislation to give it effect. And yet the startling fact confronts us that most of the solid social advance our people have made and enjoy today is not the result of legislation at all. It was not political in its conception or adoption. It came out of the growing social intelligence of all sections of the people. And where these social advances are related to industry and pertain especially to industrial conditions, they are the free outgrowth of industry's own vision and desire, without suggestion, without compulsion and without help from politics. Equally startling is the fact that most of the great advances that industry has brought are not even yet envisioned in law and have no need to be. They have found a more abiding basis than legislation; they have found their basis in the general acceptance of them by practical men. Take shorter hours, take the minimum wage, take the five-day week, take modern working conditions, take the superior methods by which life has been made fuller in the great world of work—all of them were established without law; they exist without law; they will continue without law. Our moral and social and material progress is always in advance of our legislation.

Industry Promotes Social Progress

Now, this fact of social progress occurring through industry and not by political suggestion can be illustrated concretely. Take the modern factory as we know it. In the day of hand machines the factory was in the home. Everybody worked, infants and the aged. If it is maximum employment you want, everyone chained to a task, you had it then. The hours were long, before dawn and after dark. Conditions were sordid. Life was at such a level that leisure was a curse.

But into that dark time there came the power machine and it took employment out of the home, centering it in one place, the factory. And it brought all the evil home conditions with it—child labor, long hours, low wages, bad environment generally. The factory did not invent these evils—it inherited them from the homes of that time. The sorry fact is that while they existed in the home nothing was done to change them, not even by the politicians. In the factory, however, these evils became immediately visible and almost at once efforts were made to mitigate and abolish them. And these efforts came mostly from within the factory itself. Many of you have read of the factory acts of England which first regulated ages and hours in the mills. And it is perfectly natural to us when reading an act of parliament or an act of congress to assume that the reform it commands originated with the congress or the parliament. But the Factory acts of England, and all similar legislation in this country, were the results of a vision and an initiative, not originating in parliament or in congress, but with the factory owners themselves. In the case of England, Robert Owen, a mill owner, was one of the first reformers. Sir Robert Peel was a mill owner. Lord Ashley came up to parliament a hundred years ago with petitions from 300 mill owners of Yorkshire and large numbers of manufacturers from Lancashire praying for parliament to establish the 10-hour day, a most advanced and revolutionary proposal for that time.

That is the way these reforms always come. They are born in private practice; they are tested out by private enterprise; they are proved—they spread—and become the common rights of all. It was the employer in industry who tried and proved and established the 8-hour day, the 5-day week, the minimum wage, profit-sharing, food service, medical supervision, which things exist without the requirement or without the compulsion of law to this day.

Now please do not conclude from what I am saying that all this was done out of industry's superior charity, for then we should be emulating the attitude of the politicians. It is true that 30 years ago American business went on a spree of almost millennial sentimentalism. The fantastic attempts of business men to do everything the professional reformers suggested and more, makes pathetic reading today. Of course, most of it was not founded on any principle of social justice at all. It was simply good nature run riot. At best it was a sickly paternalism.

The sentimental period did no good to anyone. It vanished in the disgust of both the employer and employee.

(*Please turn to page* 79)

Fig. 1—Solid ball 3¼ inches in diameter showing gating arrangement and chills

FOUNDING ALUMINUM BRONZE CASTINGS

By M. T. GANZAUGE

MANY parts of the products manufactured by the company with which the author is associated, are made of aluminum bronze and the nonferrous foundry department is entrusted with the successful and economical production of these requirements. Over a period of years that department has made many observations and conducted many tests and finally has arrived at what it considers to be good practice in the production of aluminum bronze castings of the type required by the company.

In the manufacture of the type of castings which will be discussed, aluminum bronze ingots of uniform analysis, 87 per cent copper, 10.50 per cent aluminum, 2.50 per cent iron, are purchased from a reputable metal dealer. For complicated parts, about two-thirds new metal and the remainder gates and risers is used. For simple parts, such as glands and covers, the proportion is reversed to avoid accumulation of gates, risers and scrap.

It was not found economical to use chips or borings returned to the foundry from the machine shop and arrangements were made with the ingot supply house to take them back. Thirty tons of aluminum bronze castings left between 1½ to 2 tons of chips. When an attempt was made to use the chips, the loss of castings, caused by the dross that was formed by the chips, was greater than the saving in metal.

It is good practice to cover the molten metal with charcoal but, by all means avoid placing it in the bottom of the crucible before charging. It was found that charcoal placed at the bottom of the pot generated gases which were absorbed freely by the molten metal. After the metal was poured, these gases were liberated during solidification with the result that all castings poured from this heat were porous. How badly the metal was gassed can be seen by the large swelling of the risers in Fig. 7.

Pouring Temperature To Suit Casting

The pouring temperature should be the lowest at which a complete casting of any one design may be obtained with regularity. The large cylinders, Fig. 7, are poured at 2050 degrees Fahr. Heavy covers are poured at 1950 degrees Fahr. and ball valves, Figs. 1 and 5, in consideration of the heavy cast iron chills cooling the metal rapidly, are poured at 2150 degrees Fahr.

A much wider pouring range than that allowed for phosphor-bronze or 88-10-2 for instance, is permissible without causing a serious

Fig. 2 (Left)—Small valve seat casting showing gating arrangement. Fig. 3 (Center)—Large valve seat casting showing gating arrangement. Fig. 4 (Right)—Valve cover casting with gate and riser attached

reduction in physical properties. The lower temperature is always to be preferred where feasible, because the lower the temperature, the lower the total shrinkage. Pouring temperatures can be lowered for a certain casting by pouring it two up instead of pouring the metal through a single sprue.

Pouring must be accomplished with the least possible amount of turbulence. Molten aluminum bronze is covered with a fine film of oxide and when the film is skimmed off, another film is formed immediately. This fine, though tough film caused by interruption in the even flow of metal, will prevent union with the main body of metal. Such shots, films or folds, or whatever you may call them, become incorporated in the casting without being fused into it and frequently cause the casting to leak under pressure.

Fill Mold with Carbon Dioxide Gas

An interesting method of reducing the amount of seams or folds in castings should be mentioned. A long rubber hose is connected with a tank of carbon dioxide gas and, before a large casting is poured, this gas is blown gently into the mold cavities. Carbon dioxide gas, being heavier than air, displaces the air in the mold cavities. As the gas is invisible, burning matches stuck in the risers and sprue holes indicate whether or not the mold is filled with gas. If the mold is full, the flame is extinguished instantly.

This operation is done while the pots are being removed from the furnaces. No time is lost in pouring. The casting is poured immediately after the mold has been gassed. Since there is no free oxygen present, no oxide is formed, therefore, no seams or folds are formed in the mold cavity itself. The improvement in the quality of the castings was found to be sufficiently high to justify the continuation of this gas treatment, which is used only in the larger molds that are poured with aluminum bronze.

Fig. 5—Solid ball 4¼ inches in diameter showing one half chill and gating arrangement

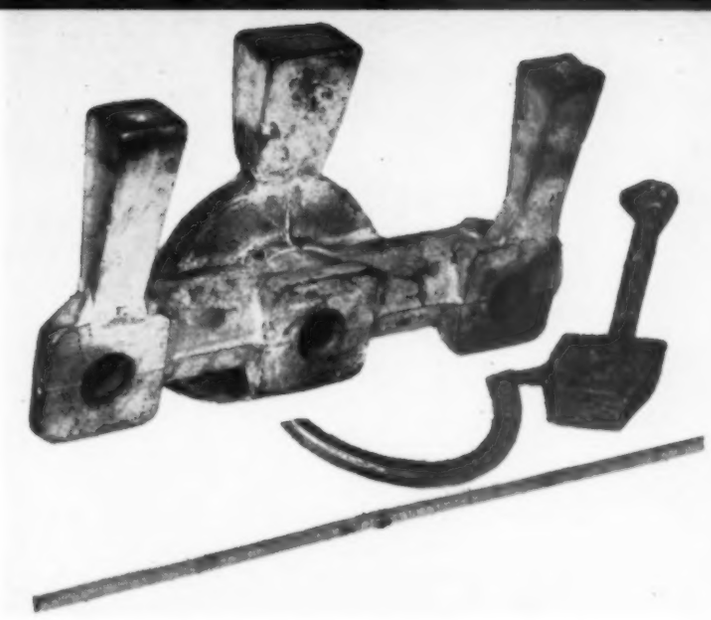


Fig. 6—Discharge manifold casting with risers. Note inclined sprue, pond and horn gate

Ball valves are an interesting job to cast in aluminum bronze. At first glance the molding and casting of such a simple looking part seems to present no difficulties. However, much time and study were required to develop a foundry technique that assured the production of good castings. The ball valve castings are cast solid in two different sizes, one, to machine to 3¼ inches, the other to 4¼ inches diameter. The smaller one, Fig. 1, will be described first.

The two main causes of imperfections are shrinkage and dross. To overcome the former, cast iron chills are rammed up as part of the drag half of the mold. These chills average about 1-inch thick. Their shape can be seen readily in Fig. 1, two being still attached to the castings and one leaning against the wall.

Method of Applying the Chills

The chills are cast of ordinary gray iron, though for long life a more heat resisting iron such as a steel mix or Ni-resist may be recommended. Care must be taken that the chills are free from any scale, rust and moisture. For that reason, they should be sandblasted thoroughly, at least on the surfaces that come in contact with the molten metal. This precaution must be observed every time they are used. No chills should be left in the mold over night.

The chills rammed in the molds must be preheated to prevent cold shuts in the castings. A rough but sufficient check of the temperature can be made by touching the chills with the hand. If one can barely touch them, the proper temperature is reached. If they are too hot, they not only dry the sand at the bottom of the mold, thus causing washing, but they defeat the very purpose of a chill. A safe way to preheat these chills is to place hot chunky pieces of steel in them.

The mold should be closed only a few minutes before pouring, to avoid any moisture deposit with in the mold. (*Please turn to page* 82)

How To Tin Gray Iron Castings

Detailed information covers every phase of equipment, materials and operation

By J. R. SWANTON

NEARLY every beginner in the art of tinning gray cast iron says "the castings are rough" or "they have a pimply appearance" or "we follow the rules, but cannot get a nice bright finish."

In dealing with that problem assume:

(1) Castings are properly cleaned
(2) Good flux is used
(3) Parts come out rough or dull.

The trouble is due to temperature, handling or both. If the roughing pots are either too cold or too hot, trouble may be expected. About 550 degrees Fahr. is right. In the absence of a pyrometer, keep the pots at just such a heat that the flux smokes. If too hot, the parts will turn iridescent colors in between the roughing and finishing pots.

Do not try to run the tin at the temperature of babbitt before pouring a bearing. If the tin chars a pine shaving, it is too hot for tinning purposes.

Control Roughing Pot Temperature

Another important point, is not to put the castings in the pot while the bath is coming up to temperature. If anything, keep the roughing pots on the high side. Generally speaking, a high roughing pot temperature gives a brighter finish. This does not mean that the castings cannot be left in the pot over night, if the temperature was correct when they were put in.

It might be well to follow the castings from the foundry to the tinning pots. Assume they have been taken out of the sand, and cleaned either by pressure blasting or tumbling in a dry mill with star shot for 12 hours. The castings should be packed just loose enough for the shot to roll. See that the pieces are not packed in such a way that the shot cannot get between them, or that they do not roll a little themselves. For example, cylindrical parts of uniform shape are likely to be packed so solidly that there is little milling action. A good operator knows from the sound of the mill whether the parts are rolling properly to secure the best result.

The milling process gives the castings a bright, hard appearance. After this they can be stored safely for weeks, as the slight rust that develops will disappear in the next step of the process.

The next step is to pickle the castings for about 12 hours in wooden pickle tanks in a solution of hydrofluoric acid and water; 1 part acid to 400 of water. This part of the process can be speeded up proportionately by using more acid.

Too much pickling produces a black sludge on the castings that is hard to remove. This will show up by the tin going on in patches. Before removing castings it is a good plan to drain the used acid solution from the tanks to save the operator's hands.

Wet Mill for High Class Finish

Just prior to the actual tinning the castings are wet milled to produce a high class finish. Use star shot and water. Be sure the shot are not worn down so much that their points will not reach into the angles of the casting. Pack the mills so that there is a good roll but not enough to damage the castings. But sure that the water does not leak away. If it does the castings become oxidized and the milling must be repeated.

After 10 to 12 hours wet milling, some operators drain the water, add muriatic acid and more water to the mills, and roll them for another 30 to 60 minutes. The acid is added in the proportion of 1 to 70 by volume. This proportion is not imperative. Good results are obtained with acid in the proportion of from 1 to 50 up to weaker solutions 1 to 100. The necessary strength of the acid solution is determined by the time taken for the acid milling.

When the acid milling is set up as a permanent part of the process, it is advisable to equip the mills with release valves, which allow the generated gas to escape, and yet seal the mills against water leakage.

It might appear that the long wet milling would do a sufficient cleaning job without the necessity for the acid treatment. There is no

question that castings will take tin in a way without the acid milling. However, experience has determined that for steady production and uniformly bright tinning, the acid milling is necessary.

This seems to be due to the fact that the type of mills ordinarily used cannot be kept bung full of water. Hence there appears to be some oxidation going on throughout the wet milling, which is disposed of by the acid treatment at the end.

The next step is to take the castings out of the mills and keep them under water until tinning time. This under water storage prevents rusting.

Before tinning, the castings must be dipped into flux. Some operators refine that part of the job by using three dipping tanks. The first tank contains a solution of hydrofluoric acid and water, 1 to 50. The next dip tank contains cold water, and the third is the flux tub, holding a zinc chloride dipping flux readily obtainable commercially.

Wash Tub Is Low Cost Tank

If quantities are relatively small, and castings are of size to permit, it will be found that an ordinary wooden wash tub makes a low cost dip tank. A light gage lead lining gives long life. The thin sheet metal bands of the commercial wash tub should be removed and welded rods substituted. Set the dip tanks on sleepers so their tops are about 24 inches above the floor.

We assume now that the roughing pots are held at temperature as previously explained. To prevent oxidation, the surface of the molten tin must be covered with a flux to a thickness of ¼ to ⅜-inch. Most chemical companies can supply solid zinc ammonium chloride for this purpose.

This flux is a granular substance and seems from experience to be a vital essential in good tinning. If handfuls are thrown on the bath they melt down to a blackish fluid which covers the surface. This is renewed by the operator as required. Skimming should be frequently carried out.

At this point we come to a conflict of practice and theory. It has been proved that the castings must remain under the surface of the tin until they arrive at its temperature. Some theoretical men have maintained that it is sufficient to hold them there until the tongs cease vibrating. A trial soon disposes of this erroneous contention.

The operators soon learn from experience how long castings should remain in the pots. The time of course is variable, depending on the amount loaded into the pots. Production is increased by having ample roughing pot capacity available at all times.

Roughing Pot Is Run Cold

The operator does not need to worry over black flux adhering to the castings. After coming to temperature the castings are picked up with tongs from the roughing pot and dropped into the finishing pot, covered with a layer of beef tallow. This pot can be run quite cold compared to the roughing pots. As it cools off the operator will notice the tin solidifies a little at the edge.

Naturally too many cold castings going into the roughing pots will pull down the temperature and the castings begin to look dull. Also the cold castings should be let down gradually into the molten tin. Otherwise they will cause small explosions.

The melted tallow should be skimmed frequently from the finishing pot, if it begins to appear lumpy. Keep it in a layer about ½-inch thick. It will be found economical to employ the same operator and the same tongs to remove castings from the roughing pot and to dip them in the finishing pot. After immersing the castings in the finishing pot, the operator removes them with the same hot tongs and hands them to the *shaker* who twirls them around to remove the surplus tin. The (*Please turn to Page* 87)

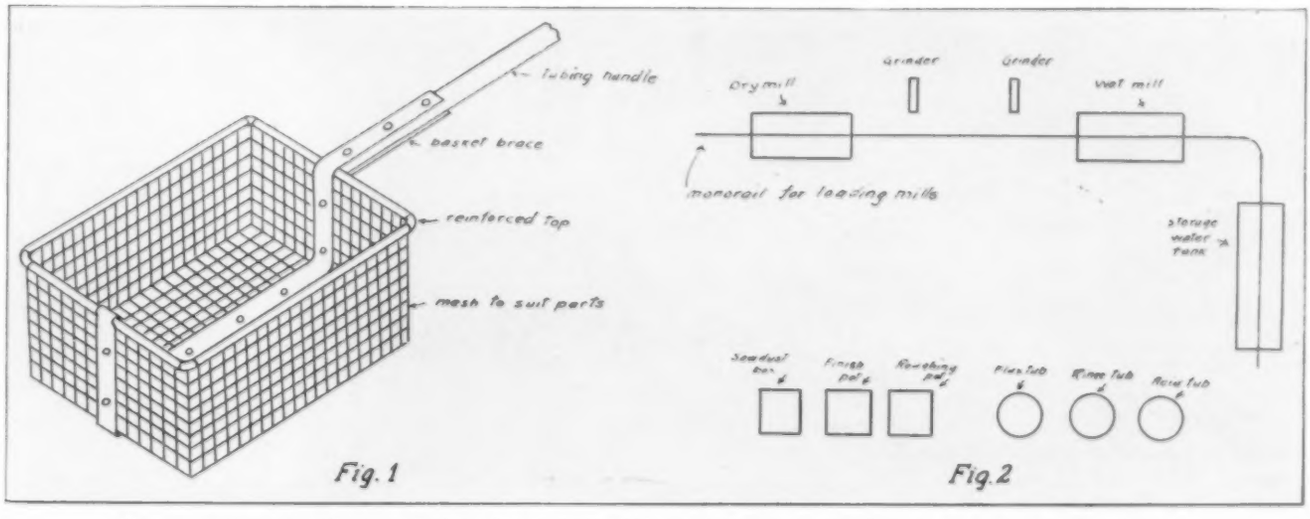


Fig. 1—A practical dipping basket for tinning. Fig. 2—Diagrammatic layout of tinning department

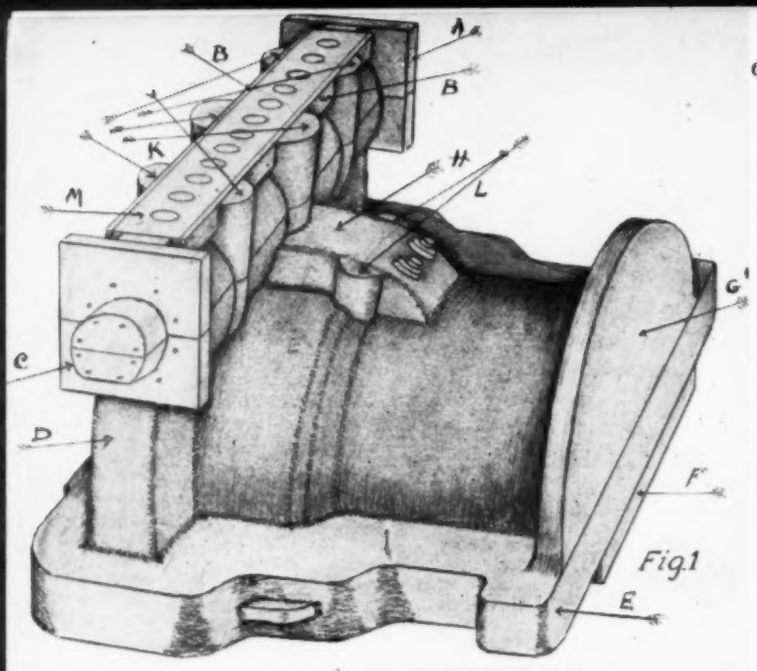


Fig.1

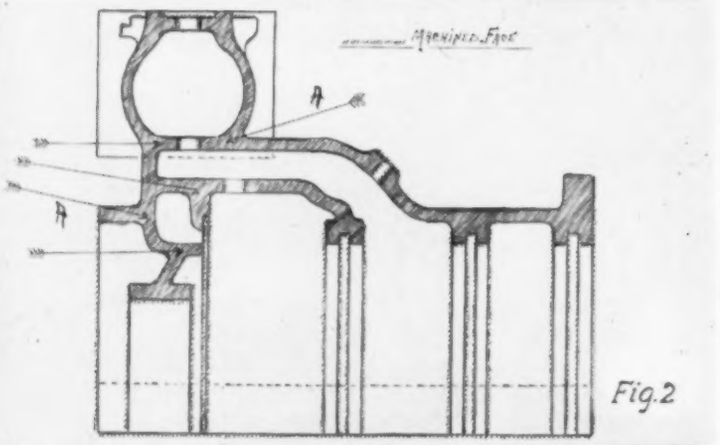


Fig.2

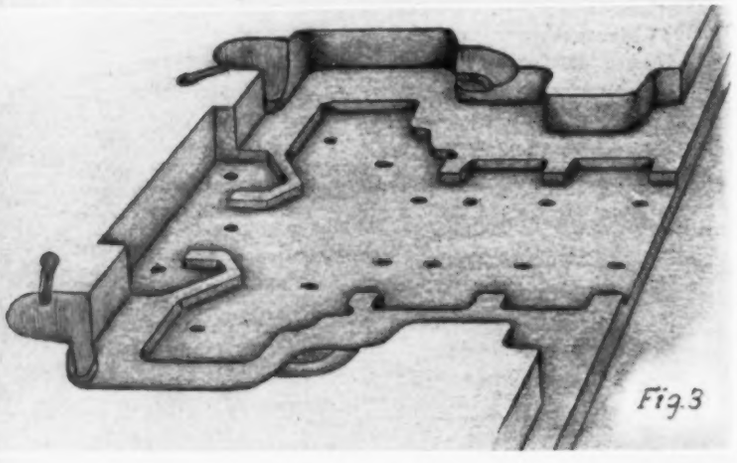


Fig.3

MOLDING STEEL

Part 1

FOUNDRY technique and experience coupled with highly developed skilled craftsmanship are exemplified to a marked degree in the production of cast steel turbine casings, especially on those intended for super heated, high pressure steam service either on land or sea. Design of these castings varies to a considerable extent and as a result a close study must be made of each as it comes into the foundry. Best method to be adopted in any given instance will depend on many general features as shown in outline and in section on the drawings. What to a casual observer appear to be two similar castings, might present a far different aspect to men exerienced in their manufacture.

Molding Method Influenced by Design

One casting might be produced satisfactorily by molding and feeding it in a joint up position. The internal design practically might force the foundryman to mold it in the opposite position. Usually from a satisfactory feeding point of view the joint up position is economical and therefore preferable. However, in many cases, especially the heavier types of castings the joint up method presents many difficulties and undesirable features. These include proper drying of mold sections, locating and securing internal core parts, releasing the casting after the metal has solidified, etc. Consideration of these factors may convince the experienced foundryman that the safest and most reliable way to mold the casting is joint side down, even though this method entails the addition of feeding strips to certain parts of the casting.

Actual service duties of the casting introduces another feature which has to be considered. Rigid specifications are set up covering the finished weight of casings designed for marine use, especially for those in naval vessels. Consequent-

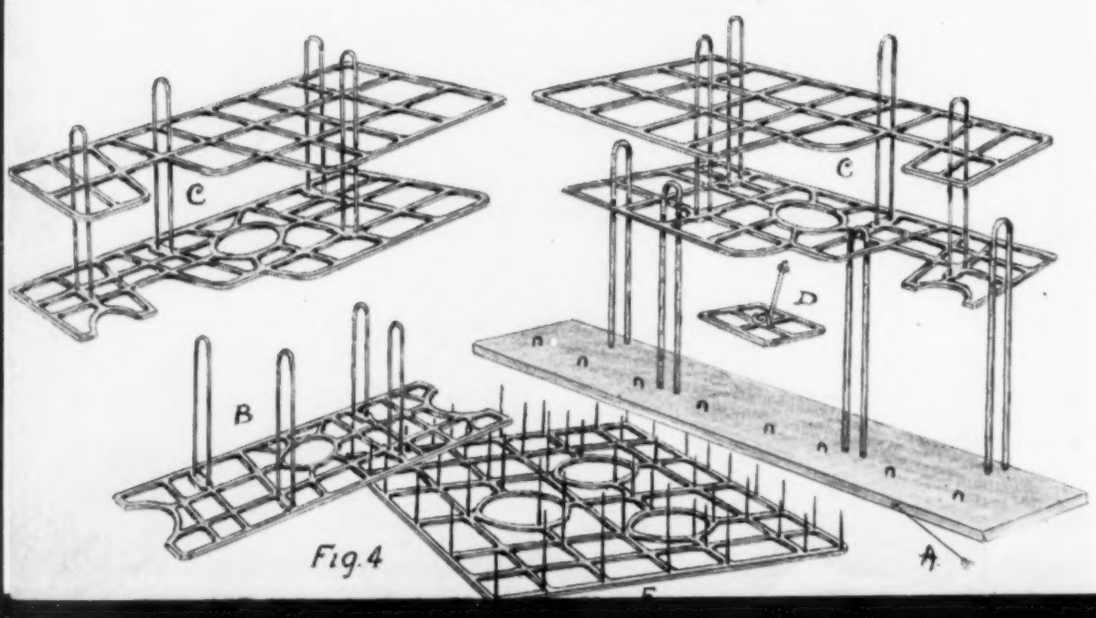


Fig.4

Fig. 1—The pattern is built in several sections. Fig. 2—Sectional view of casting through center. Fig. 3—First parting near bottom of mold. Fig. 4—Typical arbors and lifting plate used in building the mold

TURBINE CASINGS

By H. V. FELL

ly the greatest care and accuracy must be observed in locating the various sections of the molds and the cores, since this location governs the metal thickness of the casting. This thickness must conform closely to that shown on the drawing. Arrangement for pouring the metal and for feeding the casting later must be carried out in careful detail, to insure perfect homogeneity throughout the casting.

Exacting and Explicit Specifications

Specifications for subsequent heat treatment insist that the castings must be annealed thoroughly after removal of gates and risers. Going further into detail, the specifications require that the annealing furnace must be operated in a manner that will raise the casting temperature throughout its entire extent uniformly and to a definite point. Great care must be observed during the cleaning operation to thoroughly remove all fins, projections and particularly all foreign material from the steam passages. If any of this material is overlooked it will work loose later when the casting is in service and damage the nozzle and diaphragm blades.

Three examples have been selected to demonstrate from a molding and feeding, etc., point of view the advantages and disadvantages of the joint up or joint down methods. They also serve to indicate how the foundryman's decision is influenced by the particular

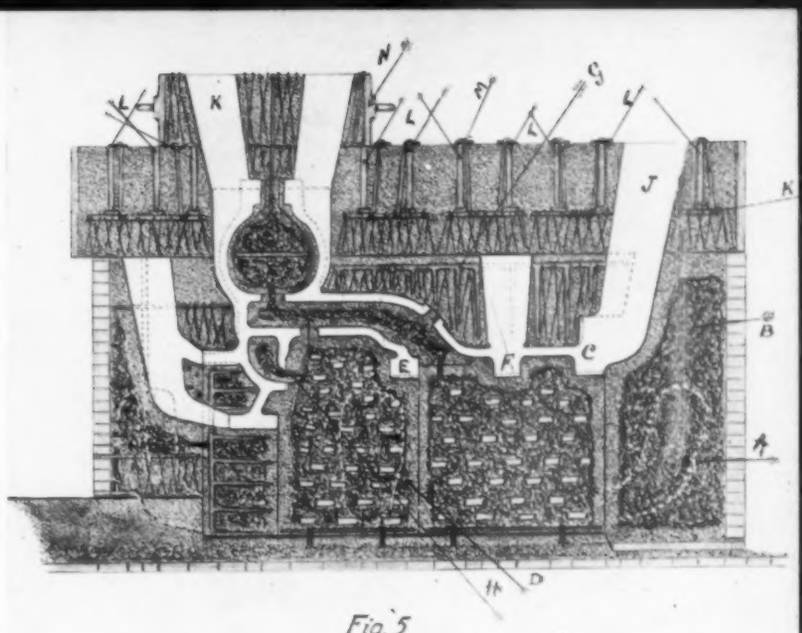


Fig. 5

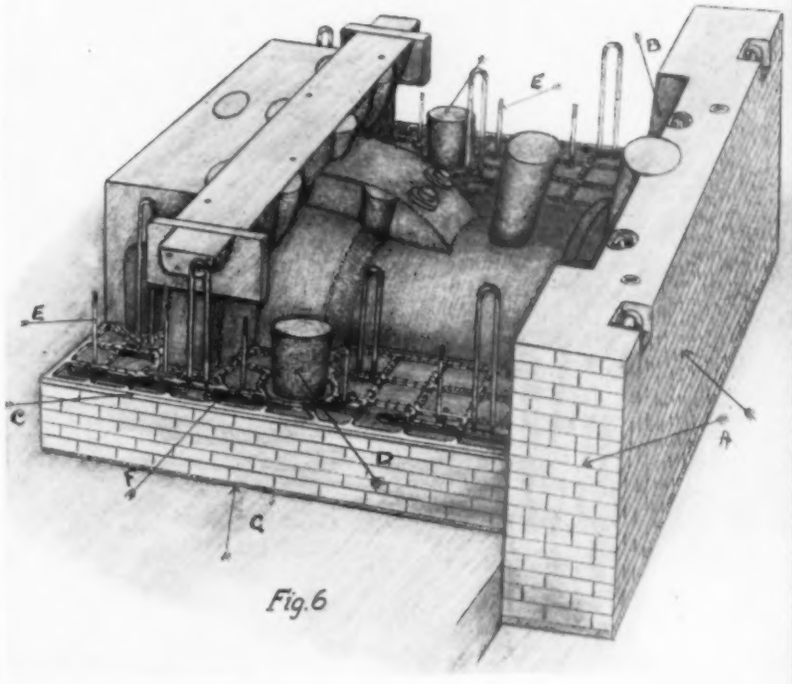
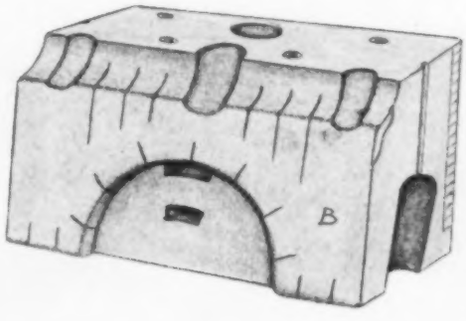
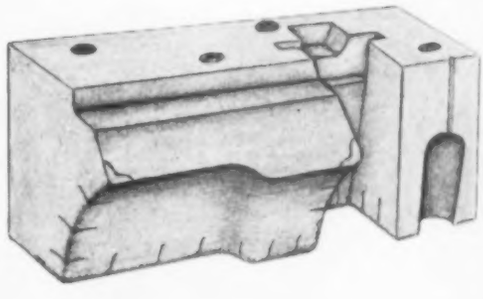


Fig. 6





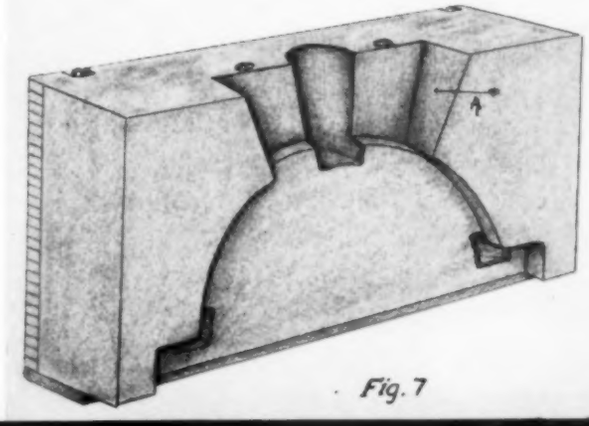


Fig. 7

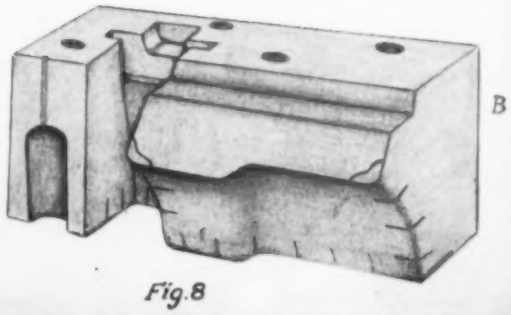


Fig. 8

Fig. 5 — Longitudinal section through assembled mold. Fig. 6— Feed risers are adusted in position as building progresses. Fig. 7 and 8—Drawbacks and sectional parts are handled as units

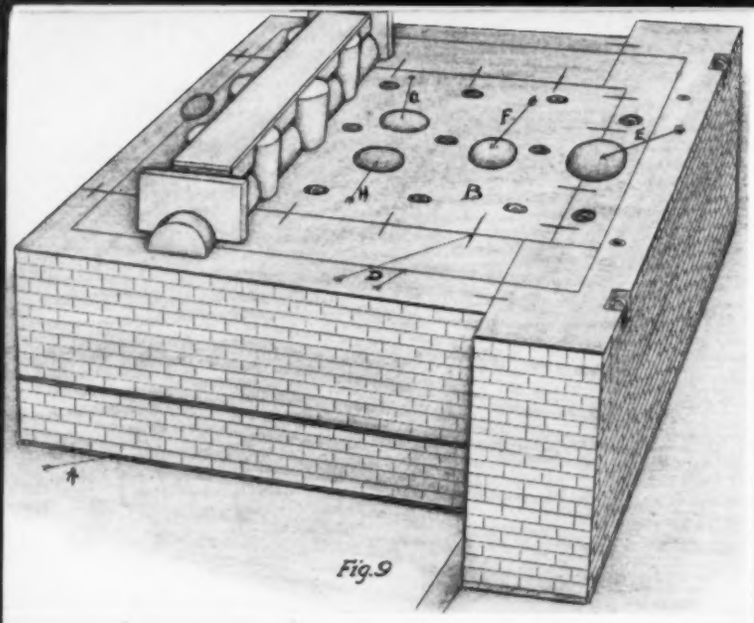


Fig. 9

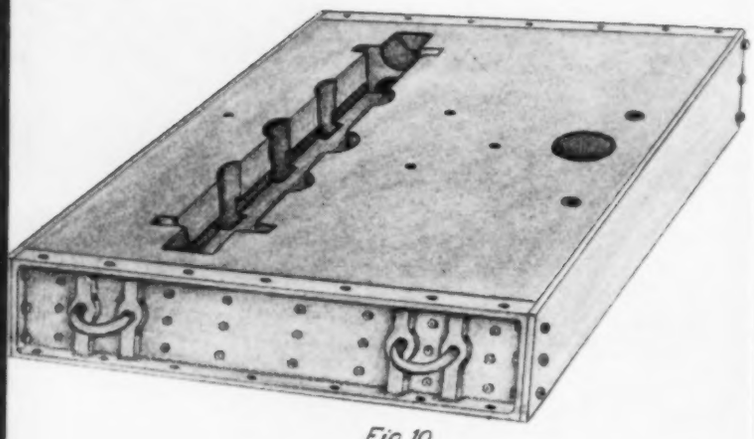


Fig. 10

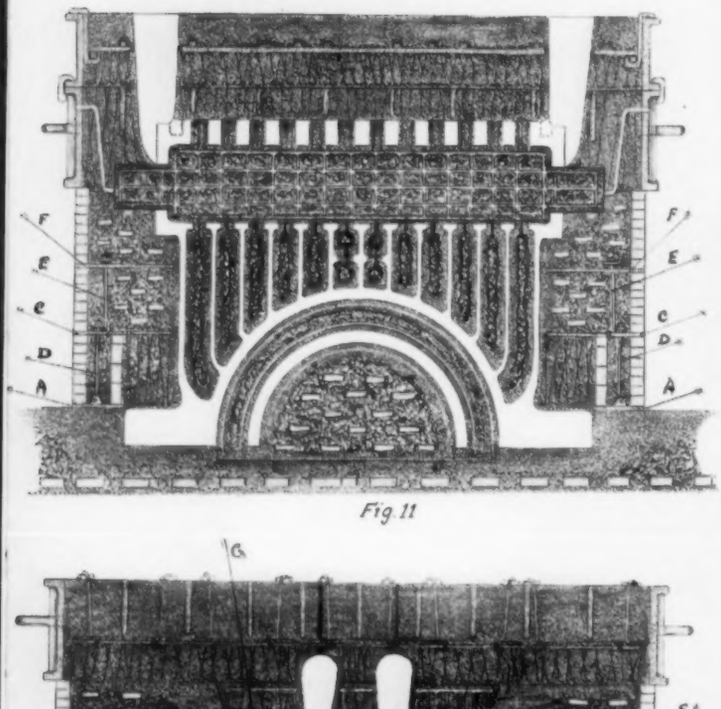
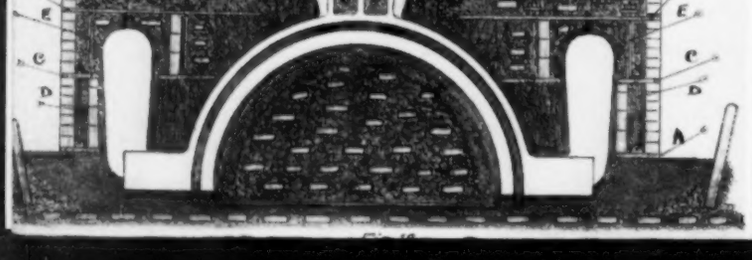


Fig. 11



design of any given casting. The present description covers the method employed where the casting is molded joint side down. Description of the second and third methods where the casting is molded joint side up will be presented in a second article to appear later.

The main features in the present instance illustrate in considerable detail the casting molded in the floor with the heavy flange on the bottom. This method involves the use of a number of drawbacks and other individual sections to form that part of the mold between the bottom and the cope.

At several points the thickness of the pattern has been increased to provide adequate passage for the molten steel from the feeding heads or reservoirs on the top to isolated thick sections below. In some instances the adjustments are made on the pattern, while in others they are effected in the coreboxes. Considerable ingenuity is required in many instances to locate these thickness pieces in suitable position for easy removal from the casting, without at the same time interfering with their efficacy as feeders. The second feature is paramount and on no account must be sacrificed in the interest of mistaken economy.

Extra Thickness Is Not Removed

Where these additions do not impair the appearance or the efficiency of the turbine unit in finished form, this applies almost exclusively to land installations, the permission of the customer may be obtained to leave these thickness parts in place. The bulky portion at the base of the feeding head is removed and of course the customer is not charged for the weight of the remainder.

Further reference to these feeding strips and the extent to which they may be included or omitted, depending on the design of the casting and its position in the mold, will be presented later, in descriptions of examples 2 and 3.

The pattern selected to illustrate the first method and shown in Fig. 1, is built in sections. The form of construction facilitates removal of the pattern from the mold. Also it simplifies operations to a considerable extent where a pattern is subject to frequent changes to meet variations in design. The top part of the steam chest *A* is separated at the half way line as shown with provision made to draw in the projecting pieces *B*. The remainder of the steam chest is divided at *C* and *D*, while the main part of the pattern is divided at *E*, *F*, *G* and *H*.

As a result of extended experience in the production of this type of casting it was considered advisable to increase the thickness at several points immediately below the desired head posi-

Fig. 9—Greater part of mold built up and ready for the cope. Fig. 10—The cope lifted off and turned over. Figs. 11 and 12—Sectional views of assembled mold near the center and at one end

tions as shown at *K* and *L*, Fig. 1 and at *A* in the corebox Fig. 19. A 2-inch thickness piece also was added to the top surface of the steam chest *M*. Study of the section Fig. 2 will show the necessity of increasing the thickness of metal at the points indicated to provide a body of live metal to feed the isolated larger section at *A*.

The brick wall of the mold is filled on the inside with a permeable composition which has high refractory qualities. To produce an improved surface appearance on the casting the face of the mold is coated with steel founder's paint, a highly siliceous and refractory material. After the various parts of the mold are dried a coating of tar is applied to the face. Some founders prefer to apply a second coat of silica wash while the mold still is hot. In the first method the tar is sprayed on the face with an air gun while the mold is at a temperature sufficiently high to burn out or evaporate all the volatile constituents of the tar.

After a suitable bed has been prepared in the floor the pattern is located in the desired position and the mold is built up to the top of the large flange joint *E*, Fig. 1. A parting is made here as shown in the view of the bottom part of the mold Fig. 3. The end drawback plate *A*, Fig. 4 then is adjusted in position and the work is continued by placing in their respective positions the internal heads *A* and the runners *B*, Fig. 5. These runners are fireclay sleeves. They form a clean, open passage for the metal and are preferable to openings in the sand with the erosion hazard always present where a large quantity of molten steel is poured through them. Faulty runners are a potential source of trouble on any type of casting and particularly on large heavy castings where a great quantity of metal is involved.

Grids Reinforce the Drawback

In the next step of the process the back and ends of the drawback are bricked up as shown at *A*, Fig. 6. The space between the walls and the pattern then is filled with rammed sand, after which a joint is formed as shown at *B*, Fig. 6, *A* Fig. 7 and *G*, Fig. 12. A little different procedure is required in ramming the drawbacks at the opposite end and those at the side and top. Part of these drawbacks overhang the pattern and for that reason a plate cannot be employed. Specially designed arbors, gratings or grids shown at *B*, *C*, *D* and *E*, Fig. 4, are employed for lifting these sections. When building these sections a number of small grids *D*, Fig. 4 are placed on the joint as indicated at *G*, Fig. 6 and at *A* in Figs. 11 and 12. A brick wall is built on these (*Please turn to page* 88)

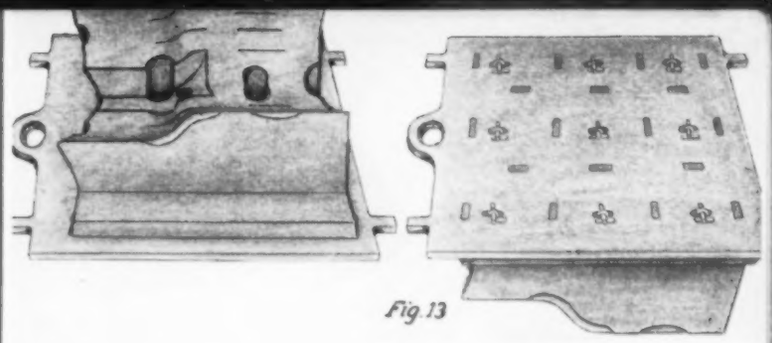


Fig. 13

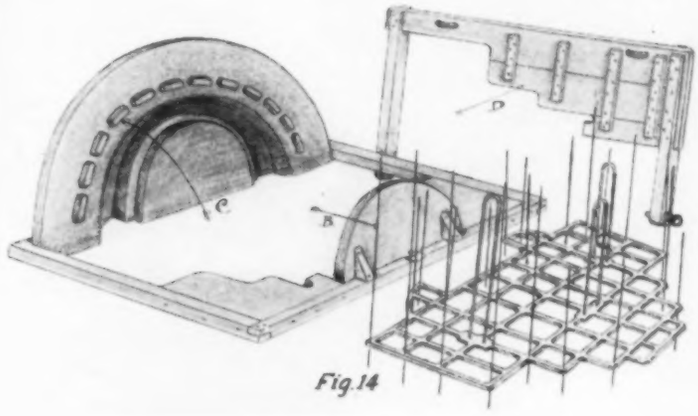
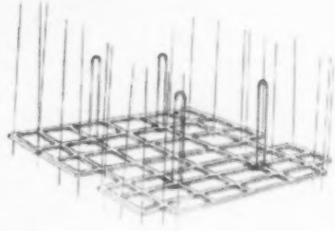


Fig. 14



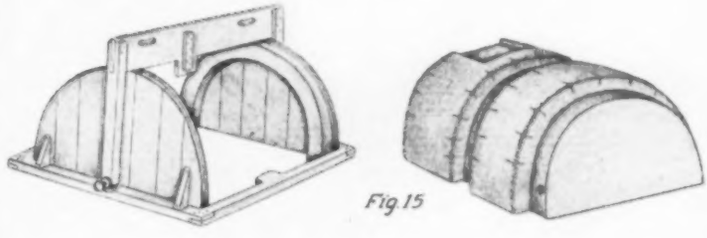


Fig. 15

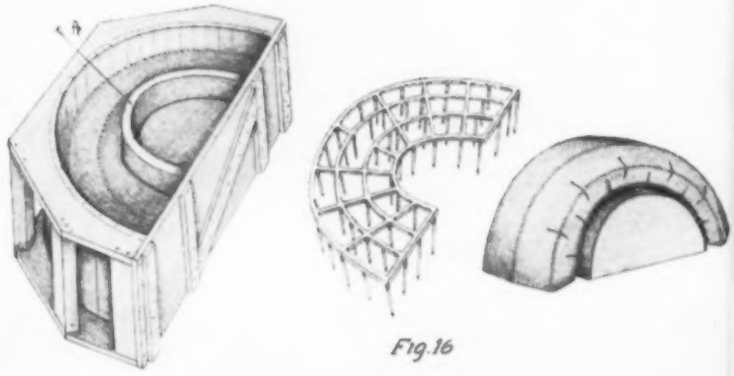


Fig. 16

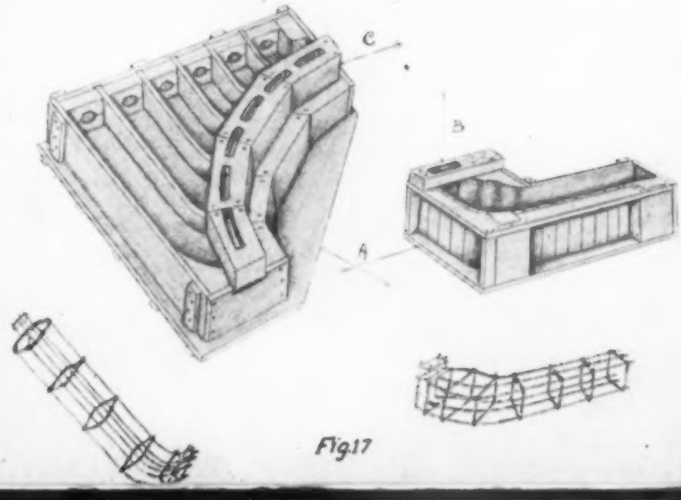


Fig. 17

Fig. 13—One of the upper parts attached to the plate. Figs. 14, 15, 16 and 17—Coreboxes, sweeps, arbors and cores for various parts of the casting

CASTS BRONZE PARTS FOR PUMPS

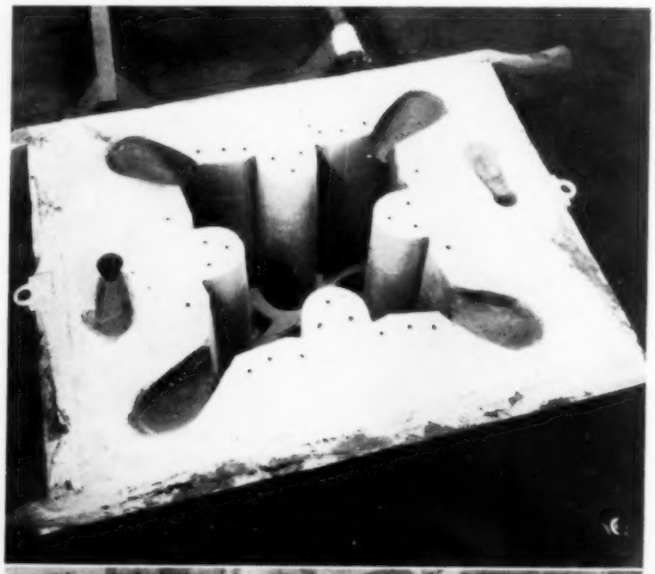
By PAT DWYER

ROTARY, power driven pumps in almost infinite variety, size, shape and capacity constitute the exclusive product of the Northern Pump Co., Minneapolis. For over a quarter of a century the company has specialized in the design and production of this type of equipment which range in capacity from little toys capable of pumping one gallon per hour, to giants which deliver 5000 gallons per minute and for pressures up to 4000 pounds per square inch.

Range of service includes pumps for handling fresh and salt water, oils, gasoline and all petroleum products, vegetable oils, molasses and syrups, milk and other beverages, paints and varnishes, vegetable juices, molten lead, soap solutions and other liquids. Paradoxical as it may seem in this inland city approximately 1500 miles from either the Atlantic or the Pacific ocean, a considerable part of the product is destined for use in the merchant marine and the navy. Mechanisms which operate airplane elevators and which carry ammunition to the guns on battle ships are actuated through remote control of pumps delicately adjusted to the nicest limit of precision. Truly a far cry from the primitive type of beam pump with back breaking hand grips and clanking pawls familiar to the hardy and hairy old mariners of a former generation who went down to the sea in ships. Pumps whose sole function was to remove the water faster from the inside than it could leak in from the outside. Unfortunately, too often the shouted order to "Man the pumps" was only a brief prelude to "Lower away the boats."

It is claimed that the company has one of the most complete pump testing equipment in the United States including practically every machine and every instrument for measuring pump performance. All pumps are tested on reactive torque dynamometers to exact operating condition. All dynamometers are the adjustable speed type and torque is weighed with precision. Speed is indicated on the switchboard and is checked by stroboscopic indication to a fraction of a revolution. Instruments include dead weight testers, speed counters, viscosity meters, thermometers, recording pressure gages, manometers,

Fig. 1—Pins on the core plates permit stacking one above another



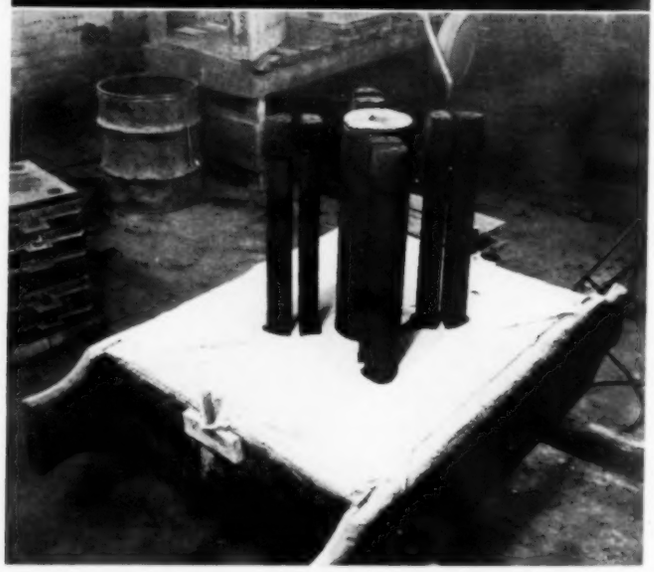


Fig. 2 (Above)—The casting is gated at two sides and fed from four corners. Fig. 3 (Below)—Drag part of rotor mold with cores in place

mercury columns, stroboscopes, electrical instruments and mechanical and electrical timing devices. Low temperature equipment includes 15-ton ammonia refrigeration for tests as low as 40 degrees below zero, and heating equipment for hot oil tests. There are five 1000-gallon high pressure tanks and air compressors suitable for operating pumps with 400 pounds suction pressure. Motor generator and transformer equipment is available for operation of motors up to 800 horsepower on alternating current at any voltage and on direct current at 250 volts and 300 horsepower or less.

The Northern Pump Co. secures gray iron and steel castings from local foundries, but the nonferrous castings are produced in a foundry adjoining the main plant and operated as a subsidiary under the title Northern Foundry Co. The foundry building of brick and steel construction is modern in every respect, amply lighted and ventilated and designed in a manner to permit extension if and when necessary. A tram rail system installed by the Cleveland Crane & Engineering Co., Wickliffe, O., and suspended from the roof beams, facilitates distribution of the molten metal.

Melt in Electric Furnace

Bronze compositions are melted in two 500-pound capacity electric furnaces made by the Detroit Electric Furnace Co., Detroit. Emergency heats are melted in three crucible type pit furnaces, but these furnaces are employed principally for melting aluminum. So far as possible, to avoid peak loads, the electric furnaces are operated at periods when the testing equipment in the adjoining building is idle. All crucibles are preheated before taking metal from the electric furnaces. The manager holds to the principle that hot metal is required to feed the castings and produce a dense, homogeneous structure. Experience has shown that metal poured cold may produce a smooth skin, but the rotor castings will draw in the corners and leak under pressure.

To insure the correct chemical and physical properties in the castings used in the application of pumps over such a wide range, over 25 standard alloys have been developed for regular use in the foundry. Ingot metal is purchased to United States navy department specifications exclusively. This metal is employed not only in pumps subjected to rigid navy inspection, but also in the pumps for any other purpose.

Sharp sand used for cores in this and other Minneapolis foundries comes from a rather unusual source. Excavation for a large new municipal sewer ran through a large deposit of sand in the old river bottom a mile wide. The partly dug excavation was flooded with water and then the sand impregnated water was pumped out.

An observant citizen with foundry training and the ability to recognize an opportunity entered into an agreement with the city which resulted in their mutual benefit. In consideration of receiving the sand free he agreed to haul it away and dispose of it. The city was relieved of the cost of hauling the sand away from the excavation. The new owner interviewed the various foundrymen of the city and offered to deliver all the sand they required at an attractive figure.

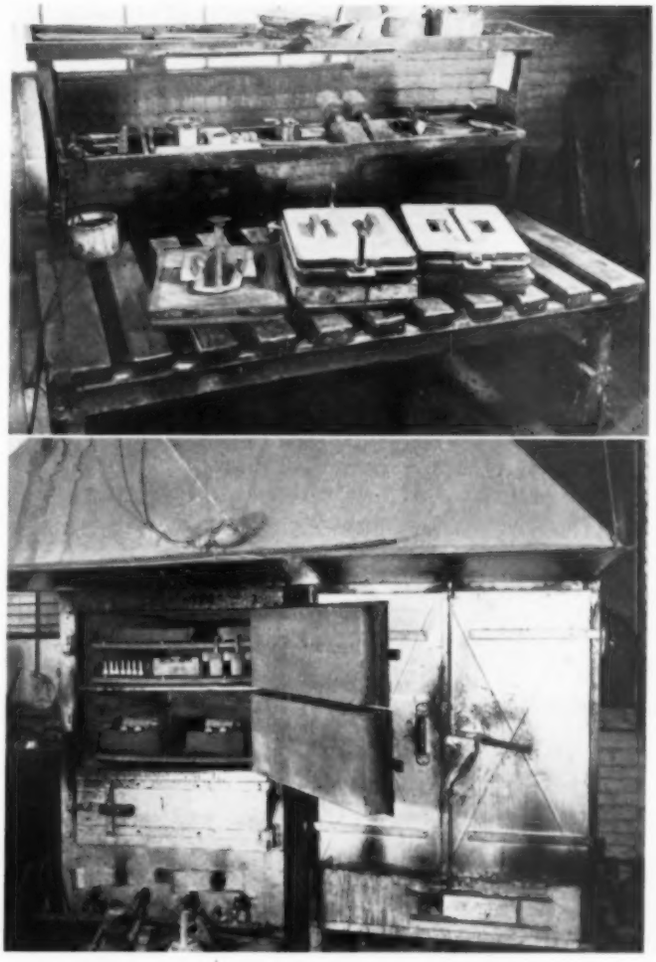


Fig. 4 (Above)—Patterns and mold for test blocks on special wood molding bench reinforced with steel strips. Fig. 5 (Below)—Core ovens are heavily insulated to conserve heat

How well this sand is adapted to the construction of plain and fairly complicated cores is shown in Fig. 1. The core third from the left, rear, is for a valve that weighs 50 pounds and is tested to 100 pounds pressure. Cores shown in the immediate foreground although concave on the plate face are made without the support of dryers or bedding sand and are not reinforced with wires or rods. The rack of three plates shown in the center represents a shop kink designed to save steps to the core oven and eliminate constant changing of core oven shelves to take care of cores in varying heights.

A small hole is drilled in each corner of the core plates. The first plate is filled with cores in the usual manner. Then four pins are placed in the corner holes and a second plate is placed on top of the pins. This routine is continued until the rack is built (*Please turn to page* 90)

GRAY CAST IRON

By JOHN W. BOLTON

Chapter IX
Influence of Gases

THE term gases refers to the gaseous elements, oxygen, hydrogen and nitrogen, and gaseous compounds, carbon dioxide, carbon monoxide, water vapor and the like. Gases in metals may be in actual solution, or they may be combined with certain other elements. As examples of the latter are combinations of iron and oxygen, forming iron oxides, nitrogen and iron forming iron nitrides, oxygen and silicon forming silica, and iron, oxygen and silicon forming silicates.

Scientific knowledge of the effects of gases in metals is at best imperfect, mainly because of the exhaustive technique required to analyze for the gases and also because of the difficulties of ascertaining accurately the forms in which they occur. However, the effects of gases are quite important in steels, copper alloys, nickel alloys, etc. A few years ago there were many opinions concerning the effects of gases in gray irons, but little if any trustworthy data were available.

Solidifying Metals Reject Gas

Most liquid metals absorb gases. Cast iron is no exception. The solubility of gases in liquid metal is greater than in solid metal so that if absorbed gas is sufficient in volume there will be visible rejection of the same as the metal solidifies. Effects of gases trapped during pouring are mentioned elsewhere. Piwowarsky—*Transactions* of the American Foundrymen's association, 1926—found carbon dioxide, nitrogen, hydrogen, carbon monoxide and methane liberated during the solidification of a high phosphorus cast iron. Bardenheuer and Ebbefeldt, Piwowarsky, and more lately Saeger and Ash attribute some of the expansion occurring during the moment of solidification to the rejection of gases from the metal. Piwowarsky reports from 1.12 to 2.74 cubic inches of gases ejected per cubic inch of metal. If these do not escape, lowered density results. High melting temperatures are held to be beneficial. Maintaining a vacuum also is claimed to lower the amount of absorbed gases.

The actual solubility of absorbed gases in solid metal probably is extremely low, although we may speculate that there might be some absorbed gases retained in graphite flakes. The possible rejection of absorbed gases into internal shrinkage cavities during solidification merits consideration. Nearly all foundrymen have noted rejection of gases from external risers during the piping period.

Aside from absorption and rejection of gases as such, the indirect actions of gases without doubt are important. Norbury and Morgan—*Proceedings* of the Iron and Steel institute, London, May, 1930—bubbled carbon dioxide, nitrogen and hydrogen through molten cast irons. The treatments seemed to have little direct effect, although the oxidation of carbon, silicon, and manganese caused by bubbling of carbon dioxide caused changes in composition and properties. Most of the arguments about the effects of gases in cast irons have centered around the influence of oxygen. In their studies of coke and charcoal irons Eckman, Jordan and Jominy—*Transactions* of the American Foundrymen's association, 1925—found a maximum of 0.014 per cent oxygen in the iron examined and failed to show any correlation between strength and oxygen content. Diergarten and Piwowarsky in *Archiv fur Eisenhuttenwesen*, April, 1930 found little direct effect due to oxide additions to irons which were melted and poured hot. Silicon, and also carbon and manganese, in the large percentages these elements occur in cast iron, are rather effective deoxidizers. Their oxidation, under suitable conditions is followed by removal of the oxidation products in bulk at least. The effects of possible small amounts of oxide inclusions are mentioned under the chapter on Superheating, THE FOUNDRY for April, 1936. This is quite different from the case of bessemerized steel, when the deoxidizers are first burned out almost completely, and must be added again, or steels in general where the percentages of natural deoxidizers, so small in relation to the amount of pure iron do not, due to laws of mass action, break down all the iron oxide and powerful deoxidizers like aluminum usually are added before pouring.

Rusty Scrap Changed Characteristics

Yet we cannot avoid the fact that iron overblown in the cupola is dull and prone to unsoundness, even though the nominal analysis may be but little changed. As clearly shown Phillips — THE FOUNDRY, Dec. 15, 1931 — the use of rusty scrap changed the chilling characteristics of an iron, even though the nominal analyses were almost unchanged. That so-called oxidized iron is sluggish, and chills readily is well known. Whether this is directly due the solid solution of oxygen, or due its reactions with elements like silicon is a moot question. It is quite well established that a small amount of a powerful deoxidizer like calcium silicide will go further than an equivalent amount of ferrosilicon in softening cast iron. Reduction of oxides by the powerful calcium may be the answer.

In the author's (*Please turn to Page* 94)

Collects Steel Castings Statistics

Steel Founders' Society provides close check on changes in capacity of industry

By RAYMOND L. COLLIER
Steel Founders' Society of America

THOSE interested in statistical information pertaining to the steel casting industry doubtless are aware that for the past 2 years the American Iron & Steel institute has discontinued its practice of collecting data covering commercial steel castings. Figures of that organization now embrace only such castings as are produced by the steel mills for their own use exclusively. These are castings for steel mill repairs or for use in assembled finished products manufactured by these mills.

This leaves the department of commerce and the Steel Founders' Society of America as the only remaining sources for authoritative statistical information covering strictly commercial steel castings sold to the trade in the open market. As the department of commerce receives over 90 per cent of their totals from Steel Founders' society, and as the capacity figures used by the government and the society have been reconciled, both sources are authoritative and in reasonably close agreement.

The monthly capacity of a steel foundry is taken as the average of the best 6 consecutive months' shipments during the preceding 10 calendar years. When application of that formula results in a revised capacity for an individual foundry, the society changes its figures, reflecting the revision in the total capacity for the industry. Similarly, when all or any part of the capacity of individual foundries is eliminated permanently from the industry's productive facilities, the society drops that tonnage from its totals. The department of commerce does not attempt to exercise so close an adjustment on the figures for available capacity. Hence it is believed the society's figures on capacity are probably more in keeping with up-to-the-minute conditions than those used by the government.

The commerce department does collect slightly larger totals for tonnage produced. Whether they include some tonnage that the society does not classify as falling within the scope of the steel casting industry is not known. In any circumstance the society's statistics do *not* include austenitic manganese steel castings or high alloy (heat-and corrosion-resisting) castings. Nor does it include tonnages produced for use by the foundries in their own finished products. The society's figures do include somewhere in the neighborhood of 95 per cent of all commercial steel castings, both open hearth, electric, converter and crucible, and embrace both miscellaneous castings and railroad specialties.

The society's statistical tables commencing with the year 1934, (*Please turn to page* 93)

Active Capacity and Production Of Commercial Steel Castings

January, 1934, to Date

	Capacity	Production	Production As Per Cent of Cap.
1934			
January	110,907	22,757	20.5
February	110,381	24,001	21.7
March	109,524	32,928	30.1
April	110,663	41,078	37.1
May	111,712	49,733	44.5
June	110,026	41,850	38.0
July	109,021	37,306	34.2
August	110,905	35,433	31.9
September	109,133	25,589	23.4
October	108,886	24,003	22.0
November	110,440	21,154	19.2
December	108,509	19,290	17.8
Annual Total	1,320,107	375,122	.....
Monthly Average	110,009	31,260	28.4
1935			
January	109,794	26,737	24.4
February	108,060	27,609	25.5
March	107,936	29,850	27.7
April	108,047	29,743	27.5
May	105,916	27,276	25.8
June	103,925	25,280	24.3
July	106,104	29,131	27.5
August	104,080	33,121	31.8
September	101,549	33,587	33.1
October	102,748	39,525	38.5
November	99,906	32,856	32.9
December	98,103	34,136	34.8
Annual Total	1,256,168	368,851	.....
Monthly Average	104,681	30,738	29.4
1936			
January	100,013	40,225	40.2
February	98,072	43,008	43.9

A.F.A. Announces Plans for American Party To Visit International Congress In Germany

Tentative Schedule for European Tour

Aug. 29	Leave New York on S. S. Europa.
Sept. 3	Due Cherbourg and continue by train to Paris.
Sept. 4-8	At Paris, Hotel Ambassador. Full day city sight-seeing, excursions to Versailles.
Sept. 9	To Montreux, Hotel Montreux Palace.
Sept. 10	At Montreux. Excursion by motor boat to Chateau Chillon.
Sept. 11	At Interlaken, Hotel St. George.
Sept. 12	Interlaken. Morning free. Afternoon, to Lucerne by Bruenig Pass.
Sept. 13	At Lucerne, Hotel Montana. Excursion by mountain railway to summit of Mt. Pilatus.
Sept. 14	To Heidelberg. Hotel Heidelberger Hof.
Sept. 15	At Heidelberg. Half-day city sightseeing. Afternoon train to Wiesbaden, Hotel Rose.
Sept. 16	To Cologne by Rhine Steamer, continuing by rail to Dusseldorf. Park Hotel.
Sept. 17 to Sept. 22	At Dusseldorf, attending conference. During the stay at Dusseldorf, an excursion to Schloss Burg will be included. There also will be an opportunity to make arrangements for visits to n arby Sollingen, Elberfeld, Barmen, Essen and Wupperthal, all of which are famous for their steel industry, foundries, etc., and are within easy traveling distance from Dusseldorf.
Sept. 23	To Berlin, Hotel Bristol.
Sept. 24	At Berlin. Full day city sightseeing excursion to Potsdam
Sept. 28	To Hamburg, Hotel Streits.
Sept. 29	At Hamburg. Half-day city sightseeing.
Sept. 30	Embark S. S. New York and sail.
Oct. 8	Due in New York.

THE American Foundrymen's association has announced tentative plans for a European tour of American foundrymen in connection with the Sixth International Foundry congress in Dusseldorf, Germany, Sept. 17 to 22. Thos. Cook & Son-Wagons-Lits Inc., 587 Fifth avenue, New York, recently were appointed official transportation agents and now are making the final arrangements for the various details of the trip.

Leave New York on Aug. 29

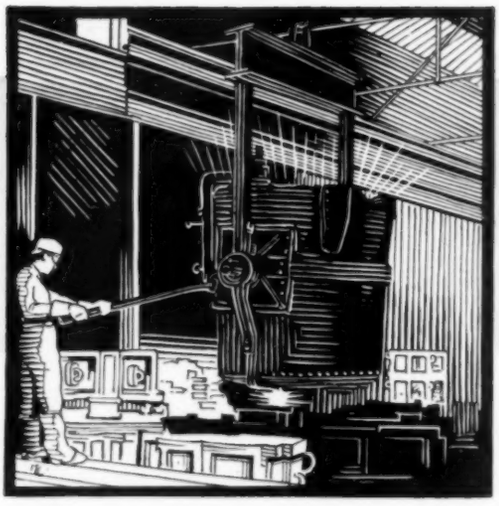
As may be noted in the accompanying tentative schedule of the trip, an exceptionally attractive tour has been arranged. Leaving New York Aug. 29 on the EUROPA, the American party will land at Cherbourg on Sept. 3 and will continue to Paris by rail. Five days will be spent in Paris and vicinity, and then the party will enter Switzerland for two days at Montreux, two at Interlaken, and one at Lucerne, all resorts of considerable interest to the American traveler. This part of the pre-congress tour should be especially enjoyable for the members of the party.

From Lucerne, the party will go to Heidelberg, Wiesbaden, Cologne, and then to Dusseldorf, arriving there the day before the congress opens. During the congress, which extends from Sept. 17 to 22, technical sessions will be held and opportunity will be provided to visit foundries in the vicinity. Dusseldorf, one of the industrial centers of Germany, and an important foundry center, will offer much of interest to visitors to the congress.

See Modern Germany at First Hand

Following the congress, the party will visit Berlin, Hamburg, and will sail for home on Sept. 30, arriving in New York on Oct. 8. Cost of the trip will be approximately $770 for cabin class and $580 for tourist class. Further details may be secured through Thos. Cook & Son-Wagons-Lits Inc., 587 Fifth avenue, New York; the American Foundrymen's association, 222 West Adams street, Chicago; or Frank G. Steinebach, chaiman, International Relations committee of A.F.A., THE FOUNDRY, Cleveland.

During the recent A.F.A. convention in Detroit, Prof. Dr. Aulich of Duisburg, Germany, presented the American Foundrymen's association an official invitation to attend and participate in the Dusseldorf International congress on behalf of the group of German foundry associations under whose auspices the congress will be staged. An exhibition of foundry equipment will be held in connection with the congress.



Questions and Answers

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Increasing Size of Chill May Produce Results in Sprocket

We are having trouble with a sprocket wheel 24 inches diameter, 44 teeth, six spokes ½ x 2½-inches, hub 5 inches diameter, 4 inches deep with a 1-inch cored hole in the center. The specifications call for 40,000 pounds per square inch tensile strength and a ½-inch chill. The best we can get is ¼-inch chill and a tensile strength of 36,800 pounds per square inch. Our 1000-pound cupola charge is made up of 250 pounds steel, 250 pounds charcoal iron and 500 pounds car wheel scrap. Iron from this mixture shows the following analysis: Total carbon 3.25 per cent, silicon 0.93 per cent, sulphur 0.13 per cent, manganese 0.36 per cent. The castings also crack on the rim.

The problem of securing ½-inch chill on a comparatively light casting, a tensile strength of 40,000 pounds per square inch and a machinable hub involves a very nice and delicate balance in the melting and molding operations. We suggest a heavier chill ring than the one at present in use. The present analysis might be improved by raising the manganese to 0.50 per cent, and by the addition of 0.50 per cent chromium and 1.00 per cent nickel.

Dense Brown Smoke Indicates That Iron Is Being Burned Out

We would like to know what causes a dense brown smoke to come off the metal at the spout and out of the stack. This condition is caused when light steel rails are used in the mixture with the following analysis: 1 per cent silicon and a 6000-pound charge with 70 per cent steel rails. The trouble occurs only when we use our 84-inch cupola with which we use a coke bed of 4800 pounds, 60 inches above the tuyeres.

The dense brown smoke to which you refer is iron oxide which results from oxidation or burning the iron during the melting process. However, we cannot say definitely why that should occur as you mention that the bed is 60 inches above the tuyeres, and according to our calculations the 60-inch figure is right for a 4800-pound coke bed. That is, of course, assuming that the cupola is 84-inches outside diameter lined down to 60 inches. Sometimes, extremely light steel scrap or scrap that is extremely rusty will cause the trouble but that does not seem to apply in your case. Consequently, the only suggestion left is to study your air supply and see that the volume is not too high.

Ordinarily for calculation purposes it is assumed that 1 pound of coke will require 131 cubic feet of air at 14.7 pounds per square inch barometric pressure, and 60 degrees Fahr. Consequently, if your coke splits weigh 600 pounds or a ratio of 10 to 1, air volume should be about 6550 cubic feet per minute on the basis of 15 tons per hour, although it may be somewhat above or below that figure in actual practice.

Application of Thin Clay Wash Eliminates Adherence of Tin

Can you give us information on a good mixture for dipping journal brasses before they are bored or lined so that the tin from the tin bath will not adhere to the unfinished or back part of the brass?

Sticking of tin to places where it is not desired can be eliminated by coating those parts with a thin clay wash. However, be sure that the coating is perfectly dry before the journal is immersed in the tin bath, otherwise the steam generated will throw tin out of the pot causing damage to the person dipping the journals and those nearby.

Core Possibly Is Responsible for Defect

We are enclosing print of a small cylinder 4½ inches in length, 1¾-inch bore. We have tried casting this in a horizontal and also in a vertical position, but in both cases we find blow holes while machining the inside. We shall appreciate your opinion on the probable cause of this defect.

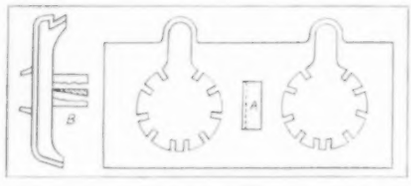
Defective areas on the inside of the small cylinder and similar castings may be due to any one of a variety of causes. The most probable cause in the present instance is a core which causes the metal to flutter slightly in the vicinity. This fluttering action produces a small amount of scum or slag which adheres to the core wall and only appears after the tool has taken a cut from the surface.

The obvious remedy is to use a more permeable core, one from which the vent can escape freely. Possibly your core is sufficiently permeable, but it may not be dried sufficiently, or, it may contain too much binder. Reduce the amount of binder in the core sand mixture, either in the shape of bank sand or artificial binder, run a ½-inch vent through the center of the core and see that the vent has a chance to escape at the ends of the core prints. The trouble may be due to wet or hard sand in the mold, or to dust washed in with the stream of iron. However, the indications point to the core and we suggest you investigate this phase thoroughly before going further in a process of elimination.

Wedge Gates for Stove Plate Castings

We are enclosing a rough sketch of a small gas range top and will appreciate your opinion on the best method of gating, also the class of pig iron to be melted in crucibles, any flux necessary and the type of molding machine best suited to the production of castings for cooking ranges.

Since no overall dimensions are shown on the sketch we assume that it is full size 10 x 17 inches with two 5½-inch openings. So far as filling the mold with iron is concerned any one of several different types of gates may be employed. Thus it may be gated at both ends or at both sides through three or four shallow branch gates attached to a runner and single sprue at each of these points. It may be gated through a single wedge gate over the center as at *A*, or by a wedge gate on top of the rim at each end as at *B*. The only objection to the outside gates, either at the sides or ends, is that a larger flask will be required than with the top wedge gates. An objection that might be urged against the center wedge gate is that it will not fill the mold satisfactorily except with very hot iron. Also, it may have a tendency to cause



Suggests use of wedge gate

the casting to warp on account of concentration of heat in the center of the casting.

Probably the most satisfactory type of gate from every standpoint is the wedge gate at each end. Power operated squeezer machines are employed extensively in stove plate foundries.

We are rather at a loss to understand your reference to melting pig iron in crucibles. It can be done of course, but the cost will be excessive as compared with the cupola method. If this is merely an experimental job, you could make up a few molds in your own nonferrous foundry and have them poured in a neighboring iron foundry.

The iron for stove plate castings is what is generally known as a soft gray iron of the following approximate composition: Silicon 2.75 per cent, sulphur under 0.10 per cent, phosphorus 0.60 to 0.80 or higher, manganese 0.50 per cent. Limestone is the usual flux employed in melting iron in the cupola, but none is required in melting the small amount in a crucible.

Sand for Light Or Heavy Brass Castings

We shall appreciate advice on molding sand, also core sand suitable for bronze castings weighing from 50 to 500 pounds.

A general purpose molding sand for the range of castings outlined would conform approximately to the following specifications as laid down by the American Foundrymen's association: Grain size 60, green strength 3, permeability 65, moisture 5 per cent. However, under certain conditions where the metal section is extremely thin, or conversely where a great weight is present in small bulk, different grades of sand would be more suitable.

Other characteristics to be taken into account are the amount of bond and the silica content. As one goes up the other goes down. A heavily bonded sand will strip clean from a thin casting, but will fuse to a heavy casting. Through years of experience and adoption of modern methods of grading sand companies are in position to offer advice and supply the grade of sand best suited to the production of any class of castings.

Hard Green Sand Match Bonded with Oil

Many of our short order jobs do not warrant the expense of making pattern plates, or the more or less permanent matches or follow boards made of plaster or proprietary compounds. We shall appreciate information on how to make hard sand matches.

Nearly every foundry where hard sand matches are made, has a pet formula for the mixture. Some favor all new molding sand. Others add varying amounts of sharp sand, ranging from 10 to 50 per cent. Others again make the matches from refuse under the tumbling barrels, or from spent sandblast sand. Matches that are dried in the oven are made from regular core sand mixtures in which the sand is bonded with any of the usual core binders. In this type, naturally the frame is metal instead of wood.

A typical match for snap flask use is made in the following manner: The estimated amount of new molding sand is dried and spread on the bench or on a smooth, flat board and mixed with linseed oil and litharge in the proportion of ⅛-part litharge, ½-part oil to 25 parts sand. Under ordinary shop conditions this means a heaping shovelfull of sand, a cupful of oil and about as much litharge as will cover half the length of a trowel. This is worked up with the hands and enough water is added to bring the mass to the condition of good molding sand.

Either one of two methods may be practiced for ramming this material against the pattern. In the majority of instances the frame with a board attached to the back is rammed full of sand, struck off and the pattern is rapped down the required distance. A hollow space roughly approximating the contour of the pattern first is scraped in the sand before the pattern is rapped down. Sand then is packed closely around the pattern and is cut away or built up as may be required to follow the parting line on the pattern. High points are reinforced with nails driven into the sand.

Considerable knowledge and skill are required on the part of the molder to follow this line accurately, avoid abrupt corners and see that all sloping surfaces are uniform. The entire body of sand is packed much harder than would be necessary in a mold. The pattern is re-

moved and the match is placed in a warm place and allowed to dry for approximately 24 hours. It is then given a coat of shellac (although this is optional) after which it is placed in service. In certain instances, particularly where the irregular parting line extends a considerable distance below the joint line of the flask, a second method is practiced. The pattern is rammed in a drag with suitable blocks between the drag and the rollover board to bring the pattern the required distance above the joint line of the flask when the drag is rolled over. The sand in the drag is rammed harder than usual. After the drag is rolled over the parting is made with the greatest care and accuracy. The match frame then is set in place, filled with the special mixture and rammed hard. The surface is scraped off flush and the bottom board is nailed or screwed in place.

In some instances the frame may be lifted off after the manner of any cope, while in others it may be advisable to roll drag and frame over as a unit and then remove the drag. Since this drag has served its purpose and is of no further use it is shaken out. The joint face of the frame is touched up here and there if necessary, the pattern is removed and the match is dried as in the first instance. Some foundrymen favor clay instead of sand as match board material particularly for gates of small patterns.

Soil Pipe Split When the Hub is Calked

The hubs on some of our soil pipe castings split when the lead is calked into the joint. Average analysis of the iron over a 10-day period shows: Silicon 2.04 per cent, manganese 0.62 per cent, phosphorus 0.54 per cent, sulphur 0.16 per cent.

In all probability a combination of several adverse factors is responsible for the hubs cracking when the hot lead is poured into them. In the first place iron of the analysis shown is hard and brittle and this condition is accentuated when it is poured in thin section into a green sand mold and around a green sand core.

In the second place it may be that the core arbor is a little too large, or to put it another way ,the thickness of sand is not sufficient to permit the casting to contract normally. As a result the hub cools in tension. Sudden heating by the hot lead sets up expansion in the metal already under strain and it cracks.

Possibly a slight change in the analysis of the iron may be all that is necessary. Increase the silicon content to 2.25 per cent, and reduce the sulphur to 0.10 per cent maximum by suitable additions of high silicon pig iron, or ferrosilicon, and soda ash; or by suitable readjustment of other component parts of the cupola charge.

Another possible cause of the trouble may be an ill fitting core, one that is not truly concentric with the outside. Unless the pipe is truly round and of uniform metal thickness, it will not contract normally. Although the manufacture of soil pipe castings apparently is a simple process, extremely accurate pattern and flask equipment is necessary, and close check must be held over every step in the process.

Produces Abrasive Surface on Iron Treads

We are interested in producing cast aluminum safety treads, the upper surface of which contains abrasive grains imbedded in the metal. Can you give us any information on how such treads may be made?

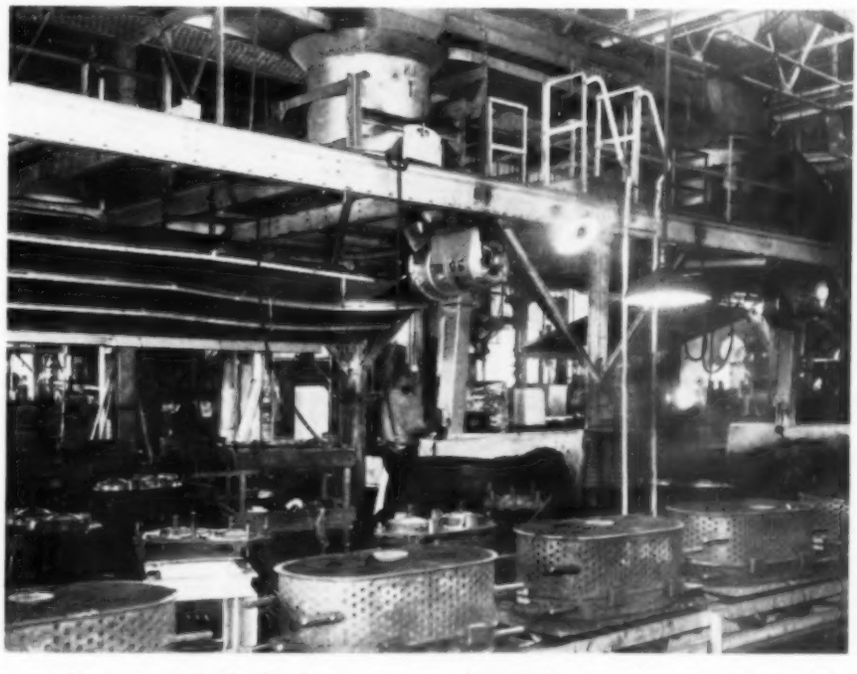
It is our understanding that the method of producing abrasive faced castings is a proprietary process. Essentially it consists in making the mold in the usual fashion and after the pattern is removed, the mold face is sprayed with a thin solution of water glass, (sodium silicate). Then a thin layer of abrasive grain which may be silicon carbide or aluminum oxide abrasive, is screened or sieved carefully over the mold face. The abrasive may range in size from 12 to 30 grit, and the sieve or screen employed should be of such a mesh that the grain will not pass through too rapidly.

After the layer of abrasive is in place the pattern is placed back in the mold and hammered down firmly, and again removed. The mold face again is sprayed with sodium silicate; another layer of abrasive screened on, and the pattern printed back as previously mentioned. The mold face is dried with a torch to remove any moisture, and then it is ready for reception of the molten metal. The metal must be poured fairly hot since the abrasive face acts like a chill, and success depends on the metal being hot enough to penetrate between the abrasive grains to hold it in place. In place of water glass, a molasses solution might be tried.

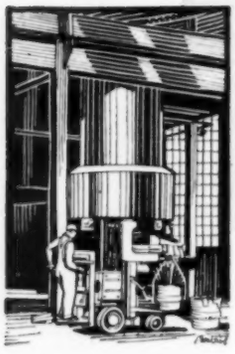
Steel Castings Not Made in the Cupola

What procedure is required to melt metal for steel castings in an ordinary cupola? What kind of flux is required, lime or oyster shells.

Metal for steel castings cannot be secured direct from the cupola. In the converter process the charge of pig iron and scrap is melted in the cupola and then the molten metal is transferred to a vessel where it is subjected to a strong air current. It is sufficient to say that the metal in the vessel is converted from iron to steel. This is the only steel making process in which the cupola is engaged. In the other methods, the miscellaneous metal charge is converted into steel directly in the furnace.



Producing automobile brake drums on a continuous basis at the plant of the Kelsey-Hays Wheel Co., Detroit, using sandslingers for ramming the molds



Viewing Foundry Developments . . . AT SHORT RANGE

OBTAINING the maximum machinability of plain cast iron containing about 2 per cent silicon, may be accomplished by annealing at a temperature of from 1472 to 1490 degrees Fahr. for at least 30 minutes, and then slowly cooling in the furnace to 900 degrees Fahr., allowing at least 1 hour for that.

♦ ♦ ♦

Silicon has a marked effect on the cold working properties of a 5 per cent tin bronze. An alloy containing 3 per cent silicon can be cold-worked only with great difficulty in the as-cast condition; after annealing at 800 degrees Cent. for 4 hours the cold-working properties are increased slightly. The addition of 4 per cent silicon to a 5 per cent tin bronze renders the material unworkable both hot and cold. Addition of silicon increases greatly the strength of a tin bronze.

♦ ♦ ♦

Castings which have chilled or hard areas may be made machinable by soaking at 1500 degrees Fahr. for 3 hours followed by slow cooling over a period of 1 hour to a dull red heat or say, 900 degrees Fahr. Slow cooling is essential for the best results.

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SOUTHERN stove foundry finds that iron for enameling should be held within the following limits: 2.25 to 3.0 per cent silicon; 0.45 to 0.65 per cent manganese; 0.60 to 0.95 per cent phosphorus; 0.05 to 0.08 per cent sulphur, and 3.25 to 3.60 per cent total carbon. Iron to be enameled should be poured from the middle of the heat, using the first and last parts for castings that are not enameled.

♦ ♦ ♦

A copper-steel casting alloy having great strength, wear and fatigue resistance, and good bearing properties for machine, engine, and automotive parts contains according to a recent patent, 1.10 to 1.30 per cent carbon; 0.50 to 0.75 per cent manganese; 1.60 to 2.10 per cent silicon; 0.75 to 1.0 per cent chromium and 2.0 to 3.0 per cent copper. As cast the brinell hardness ranges from 364 to 418, and the castings should be normalized at 1425 to 1650 degrees in a 1½- hour cycle. That reduces the brinell hardness to 340 at which the castings are machineable.

♦ ♦ ♦

Various alloys and metals both ferrous and nonferrous, may be surface hardened by cementation with antimony. A patent on the subject states that best results are obtained by plating the base with antimony and then heating in a neutral or reducing atmosphere from 400 to 620 degrees Cent. Control of the surface layer is through thickness of plating and time and temperature of cementation.

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AUTOMOBILE wheel hubs and brake drums cast integrally are being made of a cast alloy containing 0.90 to 1.0 per cent silicon, 0.40 to 0.60 per cent manganese, 1.50 to 1.75 per cent copper, and a total carbon from 1.40 to 1.60 per cent. Since the alloy is white in the cast state, it is heat treated in a cycle occupying 6 hours as follows: It is heated to a temperature of 1700 degrees Fahr. in approximately 1 hour and maintained at that temperature for ½-hour. Then the temperature is dropped to 1300 degrees in 30 minutes, and following that is raised to 1500 degrees which takes about 20 minutes. It is maintained at the latter temperature for 30 minutes and then gradually cooled to 700 degrees in approximately 3 hours.

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According to a recent patent, the following composition is good for thin steel castings which later are welded to steel tubing: 0.25 per cent maximum carbon; 0.15 to 0.65 per cent manganese; 0.75 to 1.25 per cent silicon; and 0.90 to 1.75 per cent copper. Up to 0.15 per cent sulphur may be added for machinability. It is claimed that a tensile strength of 85,000 to 90,000 pounds per square inch and a brinell of 150 are obtained in green sand molds. Ordinary normalizing is desirable as it improves the physical properties by grain refinement.

♦ ♦ ♦

PUSH rods for automobile use are claimed to be extremely wear-resistant when cast in permanent molds from iron of the following composition: Silicon, 0.75 per cent maximum; 0.15 to 0.35 per cent manganese; 0.05 per cent phosphorus; 0.75 to 1.0 per cent copper; and 3.25 to 3.75 per cent carbon, with or without 0.10 to 0.75 per cent chromium or molybdenum. Previous to use, the push rods should be annealed at a temperature of 1650 degrees Fahr.

♦ ♦ ♦

In a prominent midwest foundry, floating dust is removed from the air through nine wet dust collector units. These units are located at the shake-out stations, at the sand conditioning plants, at the pressure blasting stations, at the grinding wheels and at the core sand mixing machines. Sludge from all the units is pumped to a central dewatering station where the sludge is disposed of and the water recirculated through the system from a surge tank.

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By using an insulated, covered ladle in a malleable iron foundry, it is claimed that not only is the temperature of the metal constant from first to last, but the lining remains in service for 42 days as compared with the former average life of four days for the open ladles. Superheating the metal to compensate for the loss in temperature encountered with the open ladles, no longer is necessary.

♦ ♦ ♦

In several European installations a rotary type furnace fired with powdered anthracite coal is employed for melting steel for castings. It is claimed that the chemical composition and the physical properties of the metal equal those found in steel melted by any of the ordinarily accepted methods, bessemer, electric or open hearth furnace.

HIGH SPEED AND FLEXIBILITY

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Widespread interest in this machine . . . since its introduction at the A. F. A. Convention . . . is evidence that its advantages appeal to experienced foundrymen.

No. 713 meets a wide range of requirements for a Jolt Squeeze Stripper for producing small and medium sized moulds of the split-pattern type.

The new, specially designed squeeze head with supporting arm and hardened adjustable contact pads at the rear provide the greatest possible rigidity and absence of spring during the squeeze operation. The shock-free drop of the lifting frame is another feature which will be recognized by foundrymen familiar with the operation of machines of this type.

No. 713 is adaptable for operation either with stripping plate or as a flask lift machine. Adjustable Squeeze Head for different flask heights and convenient adjustment of length of pattern draw are also included in the many features of design which combine to make No. 713 Osborn Jolt Squeeze Stripper a highly desirable operating unit for high speed, economical production of uniformly high quality moulds.

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OSBORN

A. G. Storie

H. A. Schwartz

F. A. Jensen

Men of Industry

A. G. STORIE recently was elected president, Fittings Ltd., Oshawa, Ont., succeeding his father, the late James D. Storie.

Mr. Storie was born in Oshawa in 1879, and after finishing public school entered the employ of the Ontario Malleable Iron Co., Oshawa, where he served a 4-year apprenticeship in patternmaking. Upon completion of the apprenticeship in 1900, he undertook a study of general foundry practice, working in the various departments and branches of the industry. In 1905 he was appointed assistant superintendent, and in 1910 assistant general superintendent, holding the latter position until 1918 when he resigned to become manager of the malleable and gray iron foundries, Fittings Ltd., Oshawa. In 1919 he was elected vice president of that company. Mr. Storie is a past director of the American Foundrymen's association, and has been active in his work with that organization.

FRED T. STORIE has been elected vice president of Fittings Ltd.; S. J. STORIE, secretary and treasurer; W. G. BOWDEN, director and sales manager; and DOUGLAS STORIE, superintendent of the malleable and gray iron foundries of the company.

DR. HARRY A. SCHWARTZ, manager research department, National Malleable & Steel Castings Co., Cleveland, was awarded the degree of doctor of engineering by Case School of Applied Science, Cleveland, on June 1. Dr. Schwartz was born in Oldham County, Ky., and received his early education in the Louisville public schools. He graduated from Rose Polytechnic in 1901 with a bachelor of science degree, received his master of science degree in 1903, his mechanical engineering degree in 1905, his chemical engineering degree in 1931 and his doctor of science degree in 1933 from Rose Polytechnic. In 1931 he was awarded the John A. Penton gold medal of the A.F.A. for his contributions to the foundry industry. He is a Fellow of the A.A.A.S., member of the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, American Chemical Society, American Society for Testing Materials, American Society for Metals, the British Iron and Steel Institute, and Sigma Xi. He is an honorary life member of the American Foundrymen's association.

Dr. Schwartz is the author of *American Malleable Cast Iron*, published in 1922 and about 60 technical papers presented and prepared for the A.F.A. and A.S.M. He is author of two Belgian and French exchange papers of the A.F.A. Dr. Schwartz has been connected with the National Malleable & Steel Castings Co. since 1902. Until 1920 he was in Indianapolis, finally becoming acting superintendent, and since 1920 has been manager of the research department in Cleveland. He also is a member of the editorial advisory staff of THE FOUNDRY.

F. A. JENSEN recently became associated with the National Engineering Co., Chicago, as sales engineer in the Detroit territory.

Mr. Jensen served his foundry apprenticeship and received his technical education in Denmark, did further work in Germany and Scotland, and received his diploma from McLain's System in 1910. He then worked as molder, coremaker, inspector, instructor, foreman, assistant superintendent and superintendent in a number of foundries in the United States. During the war he was part owner of the Liberty Foundry, Portland, Oreg. In 1920 he went to Sweden and built a foundry, and a year later he returned to the United States as foundry superintendent of United Filters Corp.

He was connected with the Brown & Sharpe Mfg. Co., Providence, R. I. for one year, beginning in 1924, and then was associated with the Canadian office of the Sherman Engineering Corp., New York, and Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. From 1930 to 1933, Mr. Jensen was employed by the Russian government in designing a steel foundry with a yearly capacity of 42,000 freight cars and

(*Continued on page* 45)

(*Continued from page 42*)

other projects. During 1933 he represented the National Engineering Co., Pangborn Corp., Wm. H. Nicholls Co., Smith-Mayer Corp. and the Eastern Corp. in Russia. Upon returning to the United States in 1935, he became sales manager of Wm. H. Nicholls Co.

♦ ♦ ♦

HARRY W. DIETERT has resigned as chief engineer of the United States Radiator Corp., Detroit, to devote more time to the Harry W. Dietert Co., designers and manufacturers of foundry control equipment.

Mr. Dietert was born in Texas and received his early technical training at Iowa State college, Ames, Iowa. He

Harry W. Dietert

graduated in 1920 with a degree in mechanical engineering. After 2 years at Philadelphia works of the Westinghouse Electric & Mfg. Co., he became an instructor at Rice institute, Houston, Texas, in charge of shop. During 1922-23 he carried on graduate work at the University of Illinois, receiving his masters degree. He then joined the engineering staff of the United States Radiator Corp., where he was instrumental in developing the sand control method and various devices used for that purpose.

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D. V. SHERLOCK and L. DOUGLAS SMITH have been elected directors of the Blaw-Knox Co., Blawnox, Pa. Mr. Sherlock is vice president of Union Steel Castings Co., and Mr. Smith, vice president of Lewis Foundry & Machine Co., both subsidiaries of the Blaw-Knox Co.

♦ ♦ ♦

BENJAMIN B. GRACIER, who has been identified with the Caterpillar Tractor Co., Peoria, Ill., and one of its predecessors, the C. L. Best Tractor Co., for nearly 20 years, has been appointed factory manager of the company's road machinery plant. Mr. Gracier's service dates back to 1918 when he joined the Best organization as a machinist. At the time of his present advancement he was superintendent of tractor assembly and the tractor special attachments department.

♦ ♦ ♦

G. E. MAHONEY, formerly a sales engineer in the Milwaukee offices of the Chain Belt Co., will be located in the new Pittsburgh offices of that company in the Grant building.

♦ ♦ ♦

JULIUS KAHN, president since his founding of Truscon Steel Co. thirty-three years ago, has resigned his position to become vice president in charge of product development of Republic Steel Corp., Cleveland.

♦ ♦ ♦

C. R. MCDONALD, recently elected a vice president of the International Harvester Co., Chicago, has been identified with the company for 41 years. He succeeds ALBERT A. JONES who has retired because of ill health. Mr. McDonald will assume charge of manufacturing activities.

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JOSEPH FREISINGER, superintendent of the No. 2 foundry of the main works of the Allis-Chalmers Mfg. Co., West Allis, Wis., is celebrating the completion of 50 years in the employ of the company. He started late in May, 1886, when 16 years old, with the old E. P. Allis Co., Milwaukee, as an apprentice molder. In 1903 he was appointed foreman of the foundry at the Reliance works and was given charge of No. 2 foundry when it began production in October, 1923.

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GEORGE O. O'HARA has joined the sales department of the Detroit Electric Furnace Co., Detroit. Since 1930 he has been with the electrode division of Republic Carbon Co. and its successor, National Carbon Co. Prior to that he was affiliated with the open hearth and electric steel departments of Oil Well Supply Co. and Standard Steel Works Co. Mr. O'Hara came to the United States from Australia where he had been connected with the iron and steel works of Broken Hill Proprietary Co.

♦ ♦ ♦

CARL LAGER has been elected president, Morris Machine Works, Baldwinsville, N. Y., manufacturer of centrifugal pumps, succeeding the late WINDSOR MORRIS. Mr. Lager joined the organization as its chief engineer 46 years ago, and has been a leading factor in the development and application of centrifugal pumps.

PIERCE J. MCAULIFFE has been made vice president and general manager. He became affiliated with the company in 1910 as designer of hydraulic dredging equipment.

♦ ♦ ♦

C. E. SIMS, formerly assistant director of research, American Steel Foundries, Indiana Harbor, Ind., has been appointed research metallurgist, Battelle Memorial institute, Columbus, O. Mr. Sims has had wide experience in steel foundry practice and is the author of numerous technical papers on the subject of steel founding. With

C. E. Sims

G. A. Lilliequist, he was awarded the Robert W. Hunt prize by the American Institute of Mining and Metallurgical Engineers in 1933 for the paper "Inclusions, Their Effect, Solubility and Control in Cast Steel."

♦ ♦ ♦

HOWARD MCCOY, formerly general foundry superintendent, Caterpillar Tractor Co., Peoria, Ill., has become connected with the Cadillac Motor Car Co., Detroit. Mr. McCoy was formerly employed at the Chevrolet Gray Iron Foundry, Saginaw, Mich., and previous to that was affiliated for about 8 years with the Lakey Foundry & Machine Co., Muskegon, Mich.

♦ ♦ ♦

CHARLES L. BERGER, prominently connected with the malleable iron industry for the past 48 years, has resigned as chairman of the board and director of Eastern Malleable Iron Co., Naugatuck, Conn. He began his career as a stenographer in 1888 in the employ of the Tuttle & Wittemore Co., Naugatuck, and in 1897, when the name of the company was changed to the Naugatuck Malleable

Iron Co., was elected treasurer of the company.

Later when the Eastern Malleable Iron Co. was incorporated, taking over the Naugatuck, Bridgeport, Conn., New Britain, Conn., Troy, N. Y., and Wilmington, Del., Malleable Iron companies, he became vice president and in 1924 was elected president, serving in that capacity until 1935 when he became chairman of the board.

R. P. Morgan

James H. Lansing

C. F. Mayer

R. P. Morgan, formerly sales engineer of the New England district, Herman Pneumatic Machine Co., Newtonville, Mass., is now in Russia in connection with the installation of a large order of molding machines which has been purchased by the U. S. S. R. government from Herman company.

William S. Thomas recently appointed superintendent, foundry division, North Bros., Mfg. Co., Philadelphia, was graduated in 1913 from Newark, N. J. technical school. For the greater part of 1914 he was assistant to the late Dr. Moldenke in air furnace melting of malleable iron at Watchung, N. J. and at plants in Pennsylvania and Texas. From 1914 to 1923 was assistant superintendent malleable and gray iron foundry, Richardson Scale Co., Battlen, N. J. From 1923 to 1936 he was general manager of the Berks Foundry, West Hamburg, Pa.

J. H. Lansing, recently was made superintendent of foundries, Massey-Harris Co. Inc., Batavia, N. Y., and will have charge of operations of both malleable and gray iron. This brings him back once again in the malleable field in which he has spent 15 years. For 2 years he was employed by Eastern Malleable Iron Co., Troy, N. Y.; for 2 years as metallurgist, Lakeside Malleable Castings Co., Milwaukee; for 1 year as assistant to the consulting engineer, Malleable Iron Research institute; for 7 years as general superintendent and works manager, Danville Malleable Iron Co., Danville, Ill.; for 1 year as general superintendent and works manager, Decatur Malleable Iron Co., Decatur, Ill. and 1 year general manager of Grand Rapids Malleable Works, Grand Rapids, Mich. For the past year he has been connected with the new foundry of the Kelsey-Hayes Wheel Co., Detroit.

Mr. Lansing is a graduate of Williams College and has studied metallurgy in the laboratory of Dr. Enrique Touceda. He has been active in the work of the American Foundrymen's association and the Malleable Iron Research institute, presenting papers for various technical societies and is a member of the advisory committee, malleable division of the American Foundrymen's association.

Clarence P. Walker has been appointed foundry superintendent of the Kutztown Foundry & Machine Corp., Kutztown, Pa., producer of special gray iron castings. In addition, Mr. Walker will continue as a castings broker with headquarters at 1077 Sandford avenue, Irvington, N. J.

Mr. Walker has been connected with the foundry industry since 1900 when he entered an apprenticeship at Hamilton, O. Later he went to Milwaukee where he worked for the Vilter Mfg. Co., Filer & Stowell Co. and Allis-Chalmers Mfg. Co. In 1916 he was appointed foundry superintendent for the Hardie-Tynes Co., Birmingham, Ala., where he remained until 1920 when he became general foreman for Joubert & Goslin Machine & Foundry Co., Birmingham. Ten years later he resigned to establish himself as a consulant in foundry practice, later becoming plant manager for the American Abrasive Metals Co., Irvington, N. J.

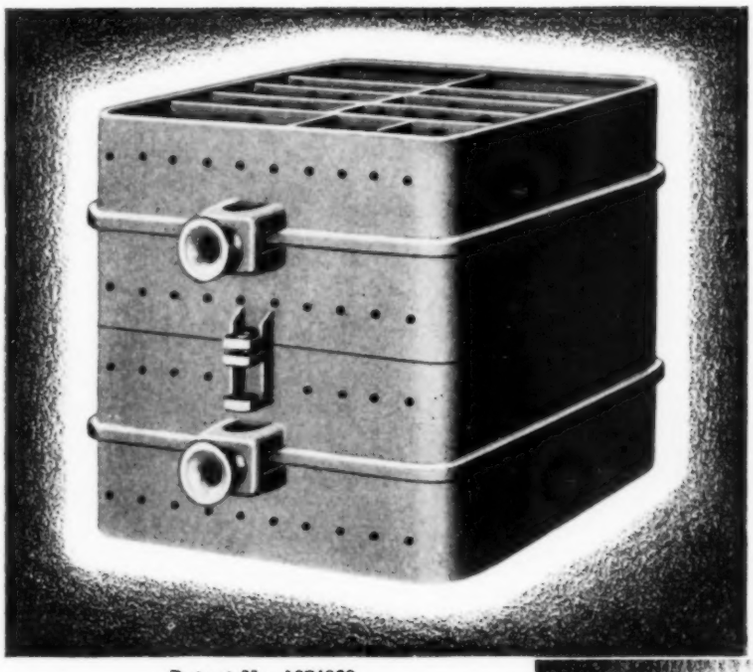
C. F. Mayer has incorporated the Carl-Mayer Corp., Cleveland, for the designing and building of core, mold, japanning, lacquer and synthetic enamel ovens, air draw furnaces, tempering furnaces, etc.

Mr. Mayer has had 17 years experience in this field, having been manager from 1919 to 1930 of the oven division of the Swartwout Co., Cleveland, vice president of the Foundry Equipment Co., Cleveland, from 1930 to 1934, and treasurer of Smith-Mayer Corp. until its re-incorporation March 1 to the Carl-Mayer Corp.

James P. Allen has been named vice president of the Machined Steel Casting Co., Alliance, O., and will be in charge of the company's Pittsburgh office, 1622 Oliver building. He formerly was president of the Union Steel Casting Co., Pittsburgh.

Gottfrid Olson has joined the National Founder's association, Chicago, as foundry engineer. Mr. Olson recently returned to this country after being associated for the past year and a half with the Pump-Separator Co., Katrineholm, Sweden. Previously he had been identified with various foundries in the United States for about 25 years.

Sterling MAXIMUM STRENGTH



Patent No. 1974292

Sterling flasks are constructed of rolled steel channels. These channels do not have a uniform thickness, the metal being distributed to form a section of maximum strength with minimum weight.

The flanges have full width bearing. They cannot curl under jolt action. During manufacture the flanges are machined to insure a perfect joint and are of sufficient thickness to permit re-finishing if necessary, at some future time.

The solid center rib resists torsion and other strains.

The steel has a high carbon content for rigidity and is copper bearing to resist corrosion.

STEEL PIN LUGS

STEEL HANDLES

STEEL TRUNNIONS

ALL WELDED CONSTRUCTION

STERLING WHEELBARROW CO.

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Elect Officers Of French Association

At the annual general meeting of the Association Technique de Fonderie held in Paris, Maurice Werts, of Fonderies Les Fils de A. Werts, Pantin (Seine), was elected president for the year 1936-37. A. Brizon, managing director of Fonderie A. Brizon, Courbevoie (Seine), was elected senior vice-president.

The following vice-presidents were also elected: A. Dady, president of the Association Amicale et Mutuelle de Fonderie; J. Derdinger, nonferrous foundry owner, Paris, honorary president of the Chambre Syndicale des Fondeurs en Cuivre et Bronze de France; Ch. Koehler, general secretary of Syndicat General des Fondeurs de France; J. Bobstein, president of Syndicat des Fondeurs en Fer de la Region Parisienne, vice-president of Syndicat General des Fondeurs de France; L. Montupet, managing director of Fonderies Montupet, Paris; H. Strube, foundry owner at Montrouge (Seine), president of the Chambre Syndicale des Fondeurs en Cuivre et Bronze de France; H. Sandre, director of Societe Metallurgique du Perigord, Paris.

The following foreign vice-presidents were elected: J. Leonard, president, Association Technique de Fonderie de Belgique, representing Belgium; J. M. Espana, consulting engineer, honorary commercial attache for Spain in Paris, representing Spain; F. Jarach, vice-president of the Italian Federation of Mechanical and Metallurgical Industries, Milan, representing Italy; L. Brasseur, representing the Grand Duchy of Luxemburg.

Roger R. Meyer was re-elected general secretary, and D. Waeles, nonferrous foundry owner at Montreuil-sous-Bois (Seine), was elected treasurer.

Book Review

Factory Equipment, by Joseph W. Roe and Charles W. Lytle, cloth, 517 pages, published by the International Textbook Co., Scranton, Pa., and supplied by THE FOUNDRY, Cleveland, for $4.00 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

This book has been prepared primarily for the engineer or engineering student who must have a working knowledge of production machinery, either from the viewpoint of selection or application for economic production. The field covered is exceptionally wide and should be of interest to all wishing more information on equipment now in use in industry.

Following a general discussion on building and manufacturing, the author considers the drafting department, patternmaking and woodworking, smelting and refining, metals used in industry, molding, casting, forging, pressing, stamping, spinning, welding, soldering, brazing, heat treating, tool room, tools for cutting metals, lathes, boring machines, drills, planers, milling machines, gear cutting machines, screw thread cutting machines, grinders, etc. While the discussion of each topic necessarily is brief, it is sufficient to present a good picture of the particular equipment or operation.

A chapter on selecting equipment, following a discussion of the various machines, serves as a summary and compares the fields of the main types of machine tool equipment. It also goes into the economics of the equipment, gives problems as illustrations, and includes charts comparing initial and operating costs. A classification of materials handling equipment is given in another chapter, with a selected description of the more important types. There is added, at the end of each chapter, a set of sample questions and a list of references.

St. Louis Chapter Holds Nonferrous Meeting

D. M. Curry, International Nickel Co., New York, was the main speaker of the evening at the May 14 meeting of the St. Louis Chapter of the American Foundrymen's association, held in the York hotel. Discussing modern nonferrous foundry practice, he outlined methods of producing sound castings in brass, bronze, aluminum, monel metal and nickel silver with special emphasis on proper sand control and the economical and beneficial effects of alloying.

Foundry practice as employed in the production of nickel silver castings was discussed by Mr. Curry and some mention was made of the effect of a small nickel content in hardening and strengthening aluminum castings. The speaker's talk was well-illustrated with slides and general discussion followed its conclusion.

Appoints Representatives

American Foundry Equipment Co., Mishawaka, Ind., has appointed the following territorial sales engineers: GEORGE H. WALSH, Graystone hotel, Buffalo, will service New York state with the exception of the counties bordering the Hudson river and the counties of Fulton, Montgomery and Schenectady. HARRY G. MOCAT, Martin building, Birmingham, Ala., will represent the company in the states of South Carolina, Georgia, Florida and the north two-thirds of Alabama and Tennessee, except within a fifty mile radius of Memphis, Tenn.

FRANK ROBER SMITH, Box 497, New Orleans, La., will handle the states of Louisiana, Mississippi, southern Alabama and the western corner of Florida. M. B. HEISNER, 303 Sugar building, Denver, will represent the company in the states of Colorado, Wyoming and New Mexico, maintaining his offices in Denver. T. C. Ruhling & Co., Burt building, Dallas, Tex., will handle the states of Texas, Oklahoma and part of Arkansas.

Industry Asked To Aid Safety Work

National Safety council, in an invitation for traffic safety co-operation, has asked American industry to assist in the saving of 18,000 lives a year. That is the number of workers, whether in industry, the mines, on farms, in trades or other gainful employment, who lose their lives annually in traffic accidents that occur either in connection with their work or after the quitting whistle has blown.

A detailed compilation of traffic death figures for 1934 and a preliminary study of totals for 1935 shows that 3000 of these occupational workers die each year in motor vehicle accidents arising out of or in the course of their work.

To help cut down the annual toll of 15,000 deaths to such workers in after-hour accidents, the council asks industry's support and active assistance. It has been estimated that each automobile accident resulting in a fatality represents an average loss to the community of at least $50,000. The skill and experience of a man, whether in industry or some other type of employment, is difficult to replace and the cost of hiring and training new people is a serious item of expense.

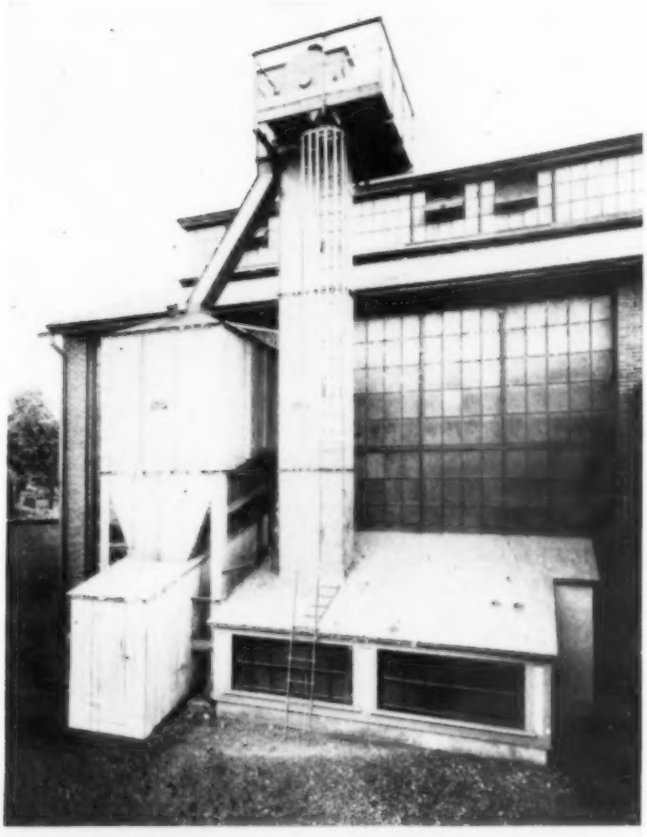
Philadelphia Group Tours Electrical Plant

The Metropolitan Philadelphia Chapter of the American Foundrymen's association participated in an unusual and highly interesting chapter function on April 10. A trip through the Philadelphia works of the General Electric Co. was planned, including luncheon in the plant cafeteria, an exhibition of man-made lightning, addresses and discussion.

D. C. Prince, chief engineer of the General Electric Co. spoke on "The Function of Switch Gear Equipment in Industry," and H. J. Huber, laboratory engineer, discussed "Laboratory Control of Materials."

Other Philadelphia organizations having a part in the inspection were the American Society of Mechanical Engineers, American Society for Metals, Association of Iron & Steel Electrical Engineers, Metal Manufacturer's Association and Society of Industrial Engineers.

HOW TO HANDLE IT IF IT IS SAND AND MOLDS



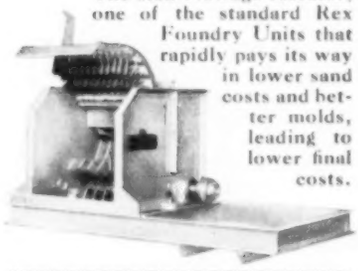
IT'S WORTH $428.00 TO SAVE $1.00 PER DAY

● The average molder spends 40% of his time shoveling sand and handling molds. The average foundry employs 20 molders at an average wage of $6.00.

On that basis the average foundry could spend $428.00 to save $1.00 per day on its molding costs. That average foundry could spend $14,677.00 on foundry sand and mold-handling equipment and pay for the investment in two years.

The Chain Belt Company has installed systems that cost less than that and met all the foundry's needs. It has installed more extensive systems that made greater savings.

This matter is something worth while talking over. Send the coupon for complete information.



The Rex-Newago Aerator, one of the standard Rex Foundry Units that rapidly pays its way in lower sand costs and better molds, leading to lower final costs.

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1671 W. Bruce St., Milwaukee, Wis.

Please send us information on Rex Foundry Systems.

Name .....

Firm Name .....

Address .....

City ..... *State* .....

Type of Foundry .....

Daily Average Production ..... Tons

REX

CHAIN BELT COMPANY
OF MILWAUKEE

Chain and Belt Conveying

Shrinkage

by H. A. Schwartz

Seventh Installment

Problem 16

REQUIRED a formula for location of the just completely frozen level in a vertical, circular, tapered ingot at the moment when the top layer has just begun to freeze. This is also the depth of pipe in such an ingot if filled at uniform temperature.

Two simplifying assumptions are made; that the conductivity per unit of surface of the mold is constant, which implies a constant ratio between casting diameter and mold diameter, and that there is perfect horizontal conductivity and no vertical thermal conductivity in the metal. Since the latter condition can not exist the present solution will give a minimum value for the depth of piping which in practice will always be exceeded.

Let R_1 and R_2 be the radii at the top and bottom of an ingot of height, H. Let ρ (rho) be the density of the metal, c be its specific heat and L its latent heat of fusion. Let θ_0 (theta sub zero) be its pouring temperature and θ_f be its melting point both measured above the temperature of the mold exterior. Let a be the conductivity of the mold per *unit area of casting surface*.

One may derive[49] two equations for the time, T, required for a section of radius, r, to cool from θ_0 to θ_f and for the time required for it to cool to this temperature and freeze.

The time required for an ingot of radius, r, to *begin* to freeze is given by the equation

$$e^{\frac{a\,T}{\pi r^2 \rho c}} = 1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 r} \qquad (13)$$

which is best evaluated by writing it in the form

$$\log_e \left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 r}\right) = \frac{a}{\pi r^2 \rho c}\,T$$

$$T = \frac{\pi r^2 \rho c \log_e \left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 r}\right)}{a}$$

All the quantities in the right half are known and the value of the logarithm can be had from a table of *natural* logarithms or by remembering that the logarithm of a number to the base, e, that is, its natural logarithm, is 2.3 times its common or Briggs logarithm which is the logarithm to the base 10.

The time for the section to complete its freezing after freezing has begun is

$$T = \frac{\pi \rho L}{2\pi\, a\, \theta_f} \qquad (14)$$

Now our requirement is to find the radius, R, of the section which has just completed freezing when a section of radius, R, has just commenced. The formula then becomes

$$\pi R_1^2 \rho c \log_e \frac{\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right)}{a} = \pi R^2 \rho c \log_e \frac{\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R}\right)}{a} + \frac{\rho L R}{2\, a\, \theta_f} \qquad (15)$$

From this one may derive a somewhat long value for R as follows:

$$R = \sqrt{R_1^2 \left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right) + \left[\frac{1}{4\pi c}\left(\frac{\theta_0 - \theta_f}{\theta_0} + \frac{L}{\theta_f}\right)\right]^2} - \frac{1}{4\pi c}\left(\frac{\theta_0 - \theta_f}{\theta_0} - \frac{L}{\theta_f}\right)$$

However, it is not difficult to substitute the existing numerical values in the right half of the equation and find R and then say that

$$\frac{D}{H} = \frac{R_1 - R}{R_1 - R_2}$$

hence

$$D = \frac{H\left\{R_1 - \sqrt{R_1^2\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right) + \left[\frac{1}{4\pi c}\left(\frac{\theta_0 - \theta_f}{\theta_0} + \frac{L}{\theta_f}\right)\right]^2} + \frac{1}{4\pi c}\left(\frac{\theta_0 - \theta_f}{\theta_0} - \frac{L}{\theta_f}\right)\right\}}{R_1 - R_2} \qquad (15)$$

where D is the depth of the pipe. As is to be expected the depth to which the pipe penetrates decreases as the ingot's taper is increased. Note also that both the quantity under the radical is always greater than the last term of the numerator and the difference between it and the last term increases, all other constants remaining the same as θ_0 increases. The value of the numerator, and hence the value of D, therefore, increases with increasing θ_0, that is, the depth of piping of an ingot increases with the pouring temperature.

We may well at this stage point to a curious anomaly. It was shown earlier that for a *given mold diameter* the time for the casting to cool to any given temperature is greatest when the casting diameter is 0.6 times the mold diameter. One might compute the form of pipe in such an ingot but the solution is hardly worth the space for the purpose of this treatise. The reader may consider, qualitatively, that when the edge of the upper surface freezes the next layer below has not yet begun to freeze so that the free liquid surface does not contract as it descends until the level of maximum cooling rate is reached, thus greatly modifying the form of surface of the pipe from the steadily contracting funnel surface previously discussed.

It quite obviously is desirable, as a foundry economy,

(*Continued on page 53*)

Footnotes references will be found at the end of this installment starting on page 53.

ABBREVIATIONS PAGES REMOVED

(*Continued from page* 50)

to use the feeder of smallest volume which will completely feed a given casting. The amount of metal which, as a liquid, will fill the casting and feeder together, gives a salable amount of metal which in the cold fills the casting. We have derived for the dimensions of a cylindrical feeder on a cylindrical casting an equation (11) as follows:

$$H_1 = \left(\frac{R_1^{2\phi-1}}{R_1(R_1-R_2)} - \frac{R_2}{R_1} \right) H_2$$

in which H_1 and R_1 are the height and radius of the feeder, H_2 and R_2 those of the casting and ϕ the coefficient of contraction on freezing. The volume of the feeder is then

$$\pi H_1 R_1^2 = \pi H_2 R_1^2 \left(\frac{R_1^{2\phi-1}}{R_1(R-R_2)} - \frac{R_2}{R_1} \right) = V$$

The value for which V is least is that for which

$$(2\phi-1)R_1^{2\phi} - 2\phi R_1^{2\phi-1} R_2 - R_2(R_1-R_2)^2 = 0^{[5]} \quad (16)$$

This expression does not become zero for any condition realizable in actual practice in which R_1 must be a finite positive number. For any value of ϕ and R_2, V decreases as R_1 increases $\left(\frac{dV}{dR} \text{ negative}\right)$ hence the volume of the feeder can be reduced indefinitely by an increase in its radius and a suitable decrease in height. However, this conclusion is of mathematical interest only. The original derivation was on the supposition that the feeder cooled from its cylindrical surface only and at the same rate as the casting. If the feeder be very thin it will cool primarily from its flat surfaces and at a different rate. As soon therefore as we so far increase the radius and decrease the height that the feeder is not a tall slender cylinder, our conclusions are no longer valid.

The mathematician can deal adequately with heat flow problems only when the flow is perpendicular to the surface of the solid. Incidentally, this means that any dimensions of the solid perpendicular to the surface, if finite, shall be the same. Only these geometric solids fall strictly into this category:

(a) The sphere (all directions equal).

(b) A cylinder of infinite length (diameters parallel to a particular plane equal, other dimensions infinite).

(c) A slab (dimensions in one direction equal, all others infinite).

It is also possible to deal with solids of infinite extent in all directions and those of infinitesimal extent in one, two or three dimensions.

We have already learned to consider the cooling rate of a casting in a mold as represented without very great inaccuracy by assuming that the diffusivity of the metal is very high, the conductivity of the sand very low and its thickness small and uniform and the temperature of the outside of the mold constant. Under these conditions it turned out that the temperature of the casting was in no important degree retained in the sand but dissipated to the surrounding air at a rate proportional to the casting's temperature. The heat lost, per unit time, from the casting then is proportional to its area, and its temperature (measured above the surroundings) and the conductivity of the sand and inversely proportional to the thickness of the mold. These relations are independent of the form of the casting. However, if the sand walls are not negligibly thick there is an effect of the radius of curvature of the surface which becomes important at sharp edges and corners and at depressions or cored holes.

Since the specific heat of metal is at least approximately constant we may say that the rate of temperature loss of a casting is proportional to area and inversely to the product of its specific heat and mass.

These statements can be combined to say that for a given metal and a given sand thickness the cooling rate of a casting, at a chosen temperature, is proportional directly to its surface area and inversely to its volume. The ratio of surface to volume is thus a criterion of cooling rate which may be called the coefficient or modulus of cooling rate for the particular solid in question. These coefficients are easily computable as shown in Table IV.

Table IV

Form	*Surface*	*Volume*	*Coefficient of Cooling Rate*
Sphere	$4\pi r^2$	$\frac{4}{3}\pi r^3$	$\frac{3}{r}$
Very long cylinder	$2\pi r$	πr^2	$\frac{2}{r}$
Large plate thickness $2r$	$2A$	$2Ar$	$\frac{1}{r}$
Cylinder (length l)	$2\pi rl + \pi r^2$	$\pi r^2 l$	$\frac{2}{r} + \frac{1}{l}$
Cube (edge $2r$)	$24r^2$	$8r^3$	$\frac{3}{r}$
Cube (edge l)	—	—	$\frac{6}{l}$
Prism ($a \times b \times c$)	$2(ab+ac+bc)$	abc	$2\left(\frac{1}{c}+\frac{1}{b}+\frac{1}{a}\right)$
Regular pyramid (Tetrahedron) edge $= l$)	$1.73205\,l^2$	$0.11785\,l^3$	$\frac{14.6}{l}$
Octahedron edge l	$3.46410\,l^2$	$0.47140\,l^3$	$\frac{7.34}{l}$

From the table one learns that the cooling rate of geometrically similar figures varies inversely as their linear dimensions and that a sphere of given diameter or a cube of the same length of edge cool at the same rate which is three times as fast as the cooling rate of an infinitely large plate of the same thickness as the edge of the cube (or the diameter of the sphere). A cylinder cools twice as fast as a plate whose thickness is equal to the cylinder's diameter.

Also since the cooling rate for a given fall of temperature through the thickness of the sand mold would vary inversely as that thickness, we can come fairly close to computing the cooling rate of somewhat irregular castings even when the sand thickness is only roughly the same over the entire surface.

(*To Be Continued*)

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[5] The heat conducted outward through the mold per unit area in an infinitesimal time is

$$dH = 2\pi r a \theta\, dt$$

Heat conducted outward in time, T,

$$H = 2\pi r a \int_0^T \theta\, dt$$

This must be the sensible heat content of the layer between θ_0 and θ hence

$$2\pi r a \int_0^T \theta\, dt = c\rho\pi r^2(\theta - \theta_f)$$

$$\int_0^T \theta\, dt = \frac{c\rho r}{2a}(\theta - \theta_f)$$

But θ is a function of t for

$$\frac{d\theta}{dt} = \frac{a\theta}{\pi r^2 \rho c}$$

$$\frac{d\theta}{\theta} = \frac{a}{\pi r^2 \rho c} dt$$

$$\log_e \theta = \frac{a}{\pi r^2 \rho c} t + I$$

$$\text{at } t = 0$$

$$\log_e \theta_0 = I$$

$$\therefore \log_e \theta = \frac{a}{\pi r^2 \rho c} t + \log_e \theta_0$$

$$\theta = a^{\frac{a}{\pi r^2 \rho c} t} + \log_e \theta_0$$

$$= e^{\frac{at}{\pi r^2 \rho c}\, t} \quad e^{\log_e \theta_0}$$

$$= \theta_0 e^{\frac{at}{\pi r^2 \rho c}}$$

then

$$\int \theta\, dt = \theta_0 \int e^{\frac{at}{\pi r^2 \rho c}}\, dt$$

$$= \frac{\pi \theta_0 r^2 \rho c}{a} e^{\frac{at}{\pi r^2 \rho c}}$$

$$\int_0^{t'} \theta\, dt = \frac{\pi \theta_0 r^2 \rho c}{a}\left(e^{\frac{aT}{\pi r^2 \rho c}} - 1\right) = \frac{c \rho L}{2a}(\theta_0 - \theta_f)$$

$$\pi \theta_0 r^2 \left(e^{\frac{aT}{\pi r^2 \rho c}} - 1\right) = \frac{1}{2}(\theta_0 - \theta_f)$$

$$e^{\frac{aT}{\pi r^2 \rho c}} = 1 + \frac{(\theta_0 - \theta_f)}{2\pi\theta_0 r^2} \qquad (13)$$

The heat loss per unit of area being, at the melting point:

$$dH = 2\pi r a \theta_f\, dt$$

$$H = 2\pi r a \theta_f T = \pi r^2 \rho L$$

$$T = \frac{\pi r^2 \rho L}{2\pi r a \theta_f} = \frac{\rho L r}{2a\theta_f} \qquad (14)$$

[30] This equation which may be written

$$cR_1^2 \log_e\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right) = cR^2 \log_e\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R^2}\right) + \frac{L R^2}{2\pi\theta_f}$$

can not be solved readily except by plotting the values of the right half for the known values of θ_0, θ_f, L and c for a series of values of R and observing when the result becomes equal to the computable value of the left side of the equation. A simpler approximate solution sufficiently accurate for our purpose can be had because it is mathematically true that for small values of x

$$\log_e (1+x) = x$$

Now

$$\frac{\theta_0 - \theta_f}{\theta_0}$$

is for practical foundry purposes, as we have already seen, usually between $\frac{1}{3}$ and $\frac{1}{9}$ hence

$$\frac{\theta_0 - \theta_f}{2\pi\theta_0 R^2}$$

is between $\frac{1}{20R}$ and $\frac{1}{60R}$. Even if R be 1 (i.e. 1 cm = 0.4 inches) the value of

$$\log_e\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R}\right)$$

for the larger value of $\frac{\theta_0 - \theta_f}{\theta_f}$

will be 0.0488 instead of 0.05, a discrepancy of no importance considering the various other assumptions we have made. One can then say:

$$cR_1^2\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right) = cR^2\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R^2}\right) + \frac{L R^2}{2\pi\theta_f}$$

$$= cR^2 + \left(\frac{\theta_0 - \theta_f}{2\pi\theta_0} + \frac{L}{2\pi\theta_f}\right)R$$

$$R = -\frac{1}{4\pi c}\left(\frac{\theta_0 - \theta_f}{\theta_0} - \frac{L}{\theta_f}\right) \pm \sqrt{R_1^2\left(1 + \frac{\theta_0 - \theta_f}{2\pi\theta_0 R_1}\right) + \left[\frac{1}{2c}\left(\frac{\theta_0 - \theta_f}{2\pi\theta_0} + \frac{L}{2\pi\theta_f}\right)\right]^2}$$

The plus sign must be taken before the radical to make R positive as it must be.

[31] By setting the derivative of V with respect to R_1 equal to zero, which gives either a maximum or a minimum. But observe that ϕ is of necessity a small fraction hence $2\phi - 1$ is a negative number. Since R_1 and R_2 are both positive, the first and second terms are negative and is also the third for $(R_1 - R_2)^2$ is always positive hence for all finite positive values of R_1 and R_2 and all values of less than ½ the expression on the left of the equation becomes negative. Its value can not, therefore, be zero for any realizable values of R_1, R_2 and ϕ.

Joint Committee Clarifies Problems

Due to the efforts of the joint committee on effect of temperature on properties of metals of the American Society for Testing Materials, great strides have been made in codification of testing methods so that differences observed between materials are truly differences in materials and not in test methods. This is facilitated by the availability of a specially selected lot of steel whose long and short time high and low temperature properties are being explored thoroughly in the work of the committee, and which is available to interested parties for checking their own laboratory methods. The problem of extrapolation is being attacked by carrying out tests of 3 years duration, which are now well advanced, upon typical ferritic and austenitic steels, as well as by continued attention to the basic problem of stability.

At a recent meeting, the joint committee decided to attack the more general problem of listing for all alloys, whether or not classified today as commercial, such temperature test data as are deemed reliable and voted to employ a skilled investigator on this task under the direction of the committee headed by P. E. McKinney, Bethlehem Steel Co., Bethlehem, Pa.

One pressing problem for industry lies in the need for accurate data that are typical of the properties of various alloys placed in high temperature service. This type of testing work is expensive, and it is necessary to use extreme precautions to avoid the danger of getting data that mislead the engineer. There are few laboratories outside of those represented on the joint committee and its subcommittees which are prepared to deal properly with such problems. However, the list of laboratories using satisfactory equipment and methods fortunately is increasing steadily.

The joint committee (beginning with 1933) has offered to plan and execute for several industrial groups, experimental work to ascertain the high temperature properties of specific alloys for specific purposes, provided that the group would finance the work adequately, and would be willing to have the testing done along lines that are believed dependable. Also, the committee freely places at the disposal of properly organized industrial groups, the collective experience of its members, under the conditions mentioned.

The committee's own direct work will be primarily seeking further information on control of stability and development of test methods of engineering applicability, through work on typical materials, rather than attempting to determine properties of every alloy.

Several new fields of experimental activity are under discussion, including evaluation of low temperature properties, study of methods of determining resistance to oxidation, relation of tensile properties to the stresses obtaining in tubes in service, etc. Definite plans will be laid at a committee meeting the latter part of June. Suggestions from those interested in the high and low temperature fields on topics which should receive early experimental attention will be appreciated, and if sent to the secretary of the joint committee, N. L. Mochel, Westinghouse Electric & Mfg. Co., Lester Station, Philadelphia, in time, they will be brought before the committee at its June meeting.

Improving Conditions

National Industrial Conference Board Inc., 247 Park avenue, New York, recently completed a survey of voluntary activities for the improvement of working conditions in American business concerns. Entitled "What Employers Are Doing for Employes," the booklet covers the trend of industrial relations policies in the United States in recent years, and industrial programs instigated for the furtherance of relations between employer and employe. This latter subject includes physical welfare, privileges, and economic status of the employe, and the most adequate technique to be used for the future employment of industrial workers.

The *One* Foundry Necessity for which there is no Substitute—

—Good Molding Sand

Good molding sand has always been the first requirement for casting success. Other items have been eliminated from time to time as mechanical advancement brought new inventions—but the verdict of scientific research is that good sand is indispensable in foundry practice—the one item for which there is no substitute.

Greater demands are made every year . . . castings must be better . . . production costs must be reduced . . . output must be swift and constant . . . if the foundryman is to keep his place in the industrial scheme of things.

Chief of all the aids to profit and efficiency offered to the busy foundry is Modern Molding Sand. Years of research, conducted by leading sand companies, have established scientific sand standards which automatically assure molding success. Guesswork has been displaced by precision. Better castings have lowered overhead and increased profits.

Good molding sand is indispensable for safe economy in the operation of a foundry—yet the cost of even the best sand is nominal in foundry overhead.

AYERS CERTIFIED SANDS play an essential part in the economy of many outstanding American foundries. More than thirty grades and blends cover the exact specifications of every known casting job. The year-after-year tolerance in each grade is less than two percent. Uniform in quality and uniform in performance. Let the Ayers Mineral Company help you with your molding sand problems.

THE AYERS MINERAL CO.
ZANESVILLE, O.
52nd year

AYERS
Certified Sands:

Like a supreme court decision, two to one

The Adventures of BILL

By PAT DWYER

THE other night while sitting peaceably on the veranda in easy neglige, I asked Bill's opinion on a rather tricky problem presented in a letter I had received in the morning mail. This particular problem was beyond the range of my experience, but, as I had hoped and expected, Bill had encountered the same problem at one time in his variegated career. He admitted modestly that for a while it had him stumped, but eventually through patience, perseverence and the exercise of certain natural and inherent gifts he had found the answer.

He proceeded with a wealth of detail to cover the subject in all its multitudinous ramifications, including what he said and what the other birds had said, with a few sidelights thrown in for good measure on the personal characteristics, habits, appearance and other items of more or less general interest connected with his colleagues on that particular occasion. I regret to say that he did not refer to them as colleagues. Apparently he was hampered and opposed in his investigation by a few eminent individuals sitting in high places. The memory lingered and he now referred to these hamperers and opposers as weasels and windbags. He also used other words accompanied by virile, qualifying adjectives, the grace notes of most foundry conversational solos.

Incidentally I often have wondered why these words rigidly are excluded from newspapers and other forms of literature skimmed through by the great mass of the people, men, women and children, to whom the spoken and sometimes shouted words certainly are no strangers. On the other hand the same words are sprinkled profusely on the pages of books and magazines read by the more cultured people, who presumably are not addicted to their use. We smile indulgently and patronizingly at the—to us—silly taboos observed so childishly and faithfully by certain primitive people who live a happy and carefree life under the southern cross. A few moment's calm reflection should convince any sensible person that we have more silly taboos than could be found in a six month ziz-zag expedition through every island in the vast expanse of the Pacific, south of the equator.

All of which, of course has no bearing on the present subject. The digression merely represents the idle thoughts of a more or less idle fellow. I am no crusader laying a sharpened lance in rest with the futile idea of revolutionizing existing habits and customs.

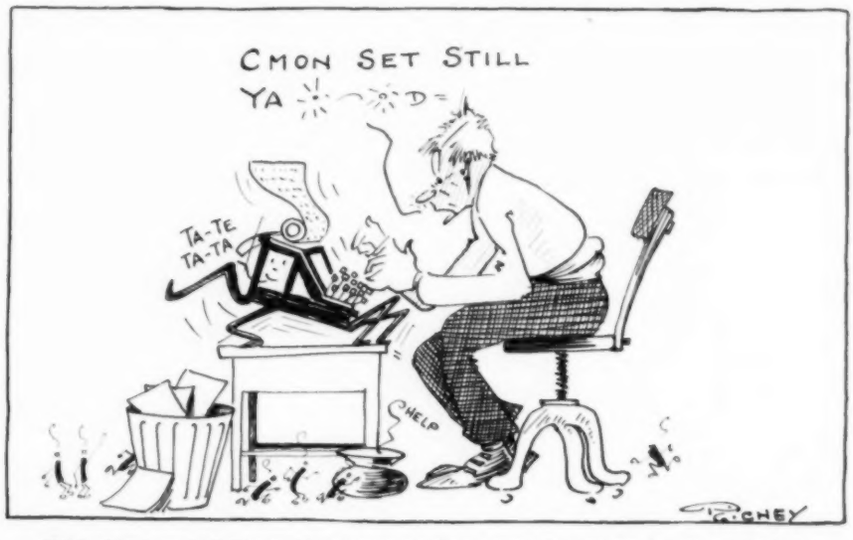
I did not express these views to Bill. First, because I know from former experience that he holds to the same opinion. Second, knowing him as well as I do, I felt reasonably sure he would find some fault either with my philosophy or with my geography. Third, because I had in mind the intention of springing on him a rather remarkable letter which had fallen into my hands several years ago, but which up to the present, for various and sundry reasons, I had never displayed for his wonder and admiration.

In fact I had forgotten all about the reception of this remarkable effusion until I came across it again the other night while rooting among the lower and more moldy strata in a drawer where I am wont to store odds and ends in the hope that some day I shall find use for them. Dredging this bit of salvage from the lower depths reminded me that I had stored it away in the somewhat vague hope that some day in the future I should learn the identity of the author.

Beyond the fact that the envelope was post marked New Orleans I had no clue on which to base a guess or start an investigation. New Orleans is quite a large town. Also the possibility existed that the letter might have been written and posted by a transient, an over night guest in that charming southern city.

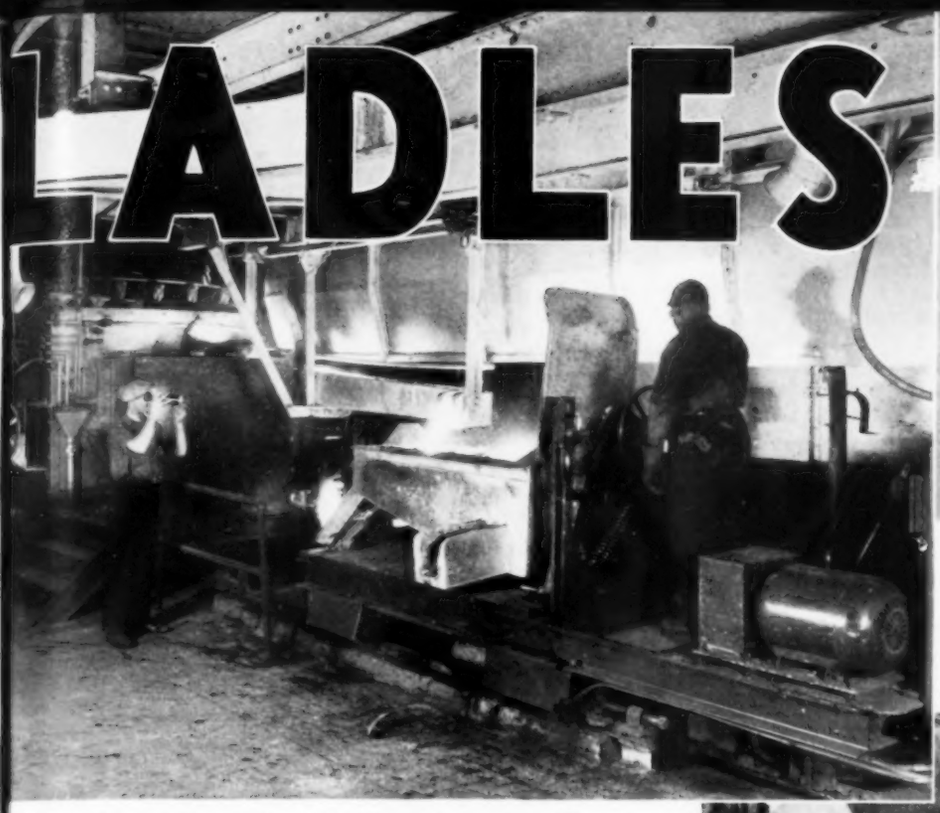
Through accident or design the writer had omitted the trifling detail of signing his name to the letter. Even the most charitable of men, oozing the milk of human kindness at every pore and all that kind of stuff, will be forced to admit that lack of signature to a letter is a rather sizable

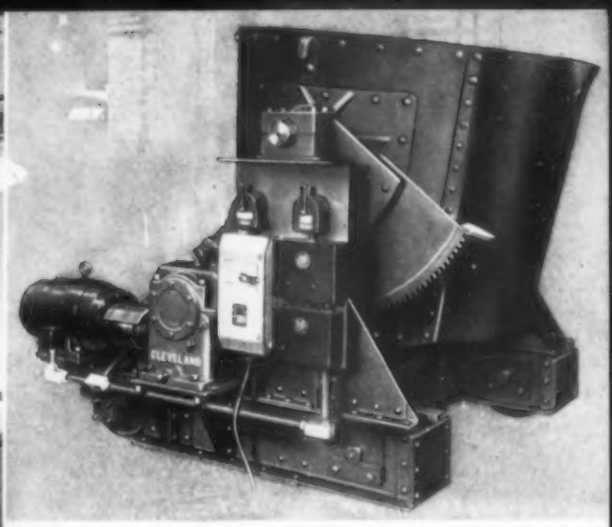
(*Concluded on page* 58)



High degree of skill required to operate one of these dancing typewriters

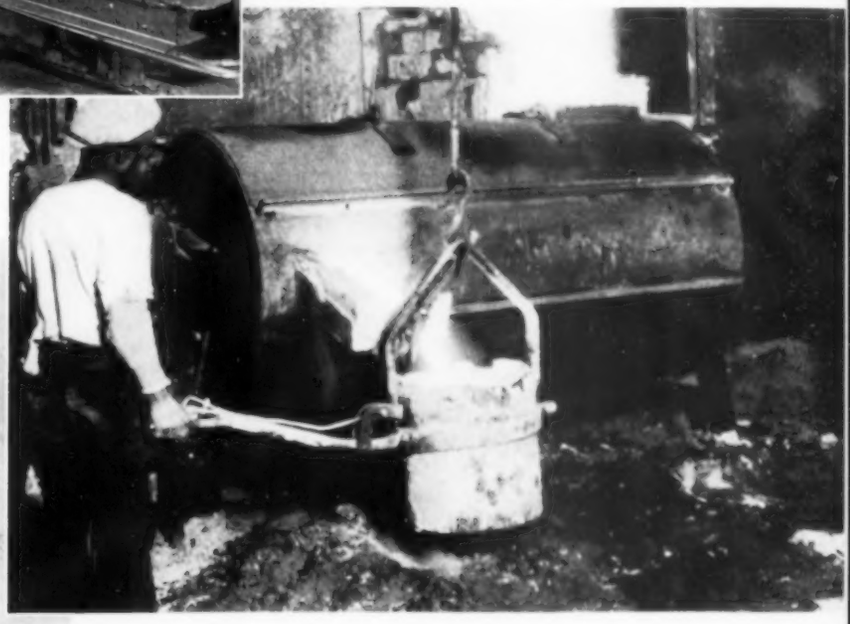
LADLES



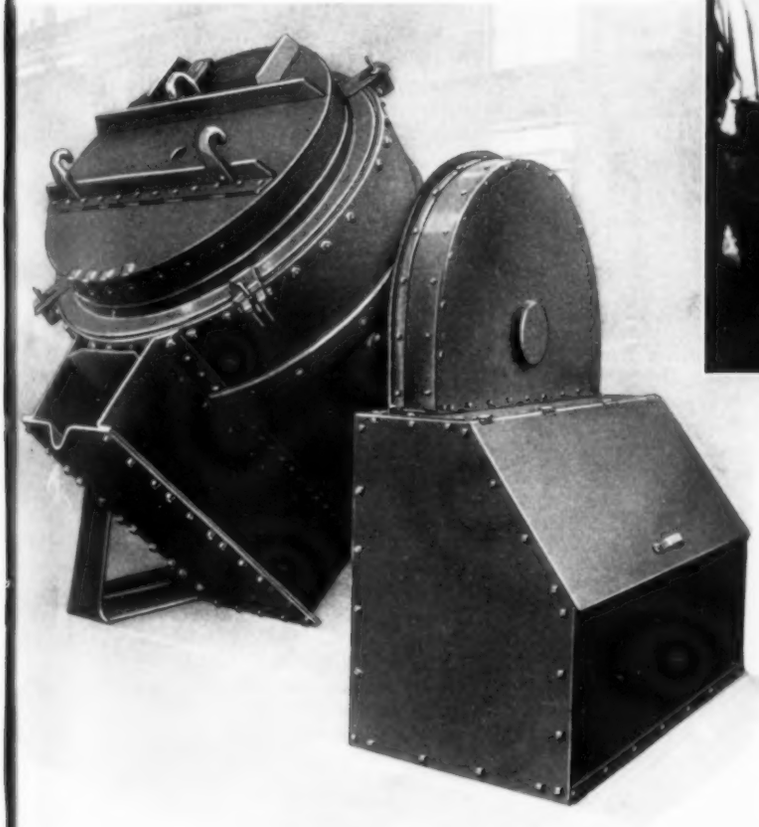


Special motor-driven reservoir ladle developed for use with Brackelsberg rotating furnace. Capacity: 8500 lbs.

Special cylindrical mixing ladle in a gray iron foundry. Capacity: 6000 lbs.



Special automatic pouring device in use in an automotive foundry, arranged to receive metal from the furnace and pour at the same time. All motions synchronized with mold conveyor. Capacity: 1500 lbs.



Special teapot type reservoir ladle with lined cover. Capacity: 23,000 lbs.

With over 50 years experience, Whiting offers foundrymen not only a complete line of standard ladles but is prepared to design and build special equipment to meet the ever changing requirements of modern casting production.

The examples shown here illustrate only a few of the many special pouring devices recently produced. Whiting engineers will gladly help solve your special problems.

Send now for our new illustrated book on Foundry Ladles—No. 216

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Electric Traveling Cranes—Cupolas—Cupola Chargers—Brackelsberg Rotating Furnaces—Air Furnaces — Steel Converters — Quick-Anneal Ovens—Tumbling Mills—Dust Filters —Stokers for Core Oven Firing—Pulverized Coal Equipment.

WHITING

PIONEERS SINCE 1884

(*Concluded from page* 56)

hurdle in the path of an investigator. The only positive clue presented by the letter was that the writer was not filled with the milk of human kindness. Far from it. He was filled with a more potent liquid. Not to put too fine a point upon it, apparently he was in the condition usually described as pie eyed, pickled, crocked or just plain stewed to the gills.

Men in that condition roughly may be divided into several classifications. For example, Class *A*, 1, 2 and 3. Class *A*1 will fight any person, any place, any time. Class *A*2 will fight only with relatives. Class *A*3 has a particular pet enemy against whom he cherishes an ancient grudge. A little dash of alcohol and the grudge bursts in flame.

Members of Class *B* feel an irresistible desire to shout or sing. This class also may be subdivided into groups 1, 2 and 3. Those who can sing, those who are tone deaf and those whose vocal range, absolute minimum to absolute maximum is approximately half an octave.

While filled to the brim with fire water, individuals in Class *C* regard every man as a well beloved brother in need of pawing and other forms of affectionate caress. Under the heading *C*1 we have the hilarious burper. The *C*2 boys are the back slappers and the indefatigable hand shakers may be coded under *C*3.

Staggering under a similar cargo, men in the *D* class overflow at the eyes and insist on pouring a tale of woe into the unwilling ear of any person unfortunate enough to be caught in their vicinity.

My unknown correspondent falls into a classification different from any of the foregoing. He is in the *E* group, section *R*, species *Q*, *pro patria mia*, which may be rendered freely into English as: Of The I Sing. He is filled with the patriotic urge to flap his wings and crow.

Reading the account of a ball game, any person familiar with that form of sport readily can visualize the scene and follow the game play by play. Similarly in this instance any person familiar with the keyboard of a typewriter can see our hero gallantly attempting to hit certain keys but unfortunately landing or rather stumbling on other keys in the immediate vicinity. Taking everything into consideration his record of accurate hits is rather surprising to say the least.

"Here," I showed Bill the envelope, "What do you make of that address?"

Psatt FDwtyer
Rthw fo GFouundry
Cllevelabdm, Ooghiop

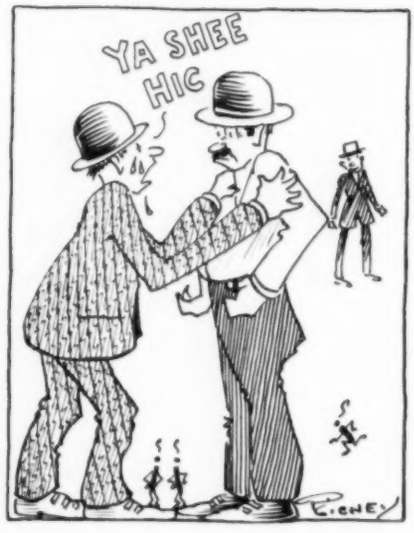
"What do you mean, address?" Plainly, Bill was astonished, "The thing looks to me like one of these here now cards the boss octupus hangs up in front of a bird having his eyes examined. I can read the words, but I can't pronounce 'em. What is it, something in Russian?"

"Russian? Not at all. Not a-tall. English as she is writ by a gent whose fingers are slightly out of control. That's only a sample. Here, brace yourself and get an eyefull of this."

I gave him the letter, typewritten (save the mark) on two sheets of plain white paper with a ¼-inch margin on the left and with the words on the right crowded close to, and in some instances hanging over the edge of the paper. The letter contained neither address, signature ner the ordinary form of salutation. It started abruptly with the title:

VLocationof IIron Foundry on the SSouth

All kin dsof raw materia/l for ythe emanafacture odi iron and steel are dpund in the South? Large depoairs



Juicy Job meets up with a friend

of iiron ore , I imston wlabnd wokww are locatedi nar each other. Fluorspar is availabble at severa/l points in thety yterit o

Hematite Teon ore, which is the most used of all rironore, constitures about 9 9r ppercent of 11 iron ore m ined ointhe UNited States. Immense bed of the Clenton Hem atite extend almost cobntinuously drom Big Stion e Bap Viirgi nia, And ter minatee aa Bir mingham where the productionof hematites is secob/ exceededd on , y by that of ljke Superior region. Rhe ore is lo cated at a considerablec depth. An escellebnt oppertu nity id afffordedforv iron making in Campnell Xounty where thereis fgood grade of iron ore and bloringd shoe thiss same ore an Scot t County about 20 miless northwest wgherewrye ezxcellent zcoking coal and kimmesto s . .

At Sweetwater Ten llarge deposits of good ore odffer a oppoertuntity for dd economical astemmsghovwl opwratoion/. Rge exxtensive Tuxkahoe fieslnortheast od KNoxvi ll e Rten n hacve re d and brown ores.

Widely escattered ddeposits of brown ore or limite are found in the Piedemont annd mountaukin ae/tion of Virginia aand in the Sheffaeld bflorenvce distrixt in Northwest Alabma R. Rthese ric h o resare easily mined an d have known sibn ecve r since the ys oof charcloa,l furnaces . TBHese klese favoranble located with colalin g ck bjut tye mo untain stre a me inth vicinity can be made to generationod electricirty at a llows cost for the operation loff electric sme lti surfaces. A bigopl portunity for the productionodf chrom e steel exist because of the rail roaf favcilities

Large deposits if magnettite ore esist in thw parts Od Vurginia, South Caeroli n abnd Nortgh Carola . . There is a large deposuit near BBela Cksbur f and alo one n near Walller amd mbifgh grade ore contain s 24 . 46 per cent of iron protoxucde 62 . 70; ; per cent iron sequisoxide , . . 75 lpwe cebnt uirin rmtamcht, 2. 90 silica, an d other minreralxs, and all thgse deposirs are now av ailavb e .

Ma n ganese ore is found iinmany loxca, litue and spec iments of deposi a neat X Clarion show axabout 48 per ccent manganese a ndi one deposuit ne neat Mounyain City carries about 46 per cent manganese A sd eposuits near Secviervil r shoe a highgfrade of manganese .

Although the UhitdState practicall consume s abo ut —0 per cent of the s hm worlds supply odf chromi u m, a bout 20000 tons are impo rted dfrlo " "

Bill blinked his eyes several times, held the paper close up and at arm's length and finally handed it back to me.

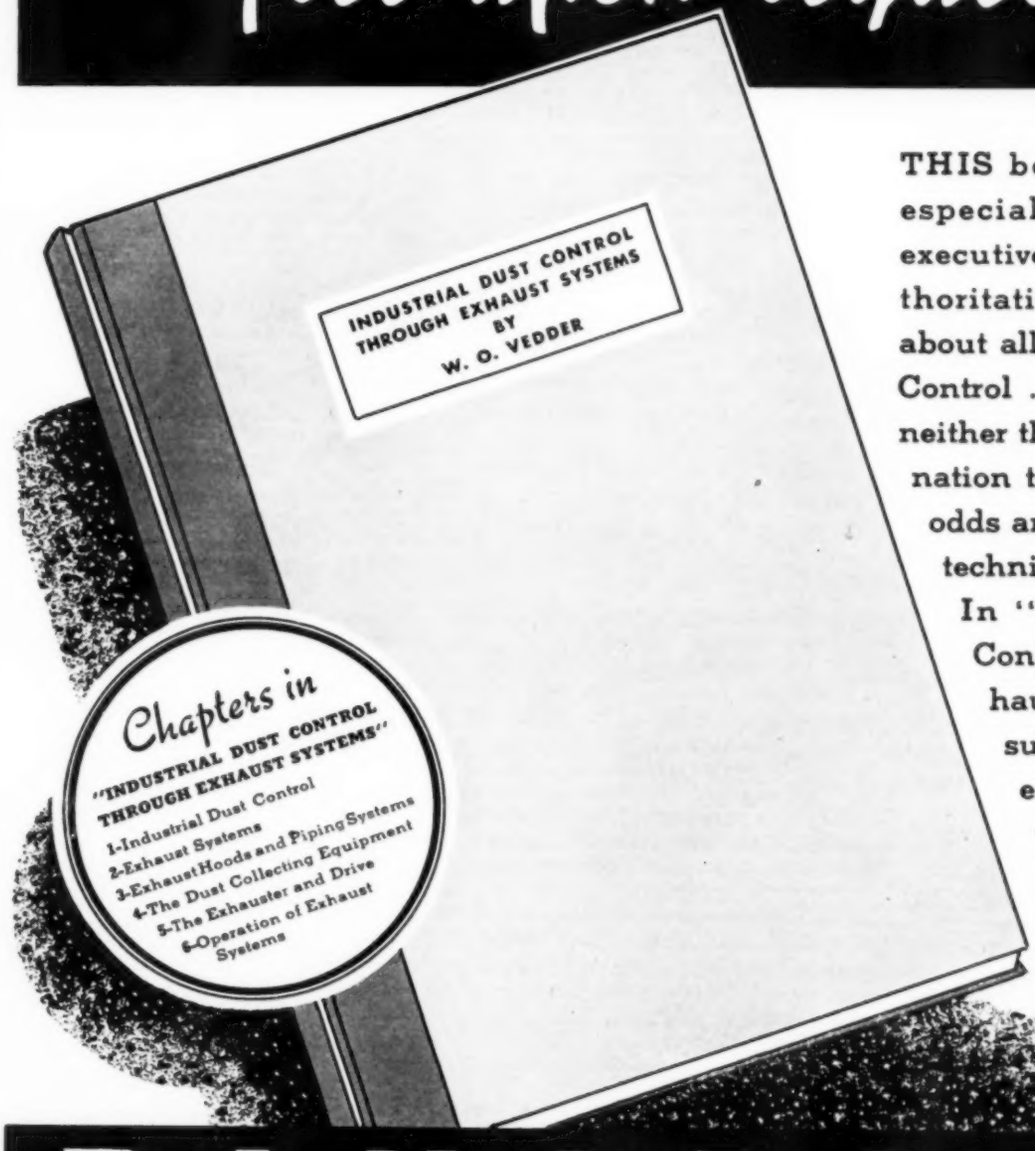
"What it is," he inquired, "A new hill billy dialect some one is trying out on you? Or is it some trick stuff you work with mirrors?"

"Well I confess I found it a little difficult at first, but after I got in the swing of the thing the going was easy. For example take the second paragraph. Hematite iron ore which is the most used of all iron ores, constitutes about 99 per cent of all iron ore mined in the United States. Immense bed of the Clenton hematite extends almost continuously from Big Stone Gap., Va., and terminates at Birmingham where the production of hematite is exceeded only by that of (the) Lake Superior region. The ore is located at a considerable depth. An excellent oppertunity is afforded for iron making in Campbell county where there is a good grade of iron ore, and borings show this same ore in Scott county about 20 miles northwest where there is excellent coking coal and limestone."

"Well," said Bill, "I'll tell you. I'll take your word for it. The lad apparently knows his iron ores, but if he will accept the advice of a friend and well wisher he will get himself a typewriter that does not shimmy all over the lot. GOOD-bye!"

A COMPLETE TREATISE ON INDUSTRIAL DUST CONTROL

free upon request



THIS book was written especially for the plant executive who wants authoritative information about all systems of Dust Control . . . yet who has neither the time nor inclination to search through odds and ends of many technical papers for it. In "Industrial Dust Control Through Exhaust Systems" the subject is well covered, and a copy will be sent to you free, upon request.

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WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

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Foundry Instructors Meet

A MEETING of instructors in foundry practice was held Tuesday noon of convention week with C. J. Freund, dean of engineering, University of Detroit, Detroit, presiding.

The following were present: R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston; E. H. Ballard, General Electric Co., Lynn, Mass.; A. V. O'Brien, State University of Iowa, Iowa City, Iowa; R. P. Schneider, Ohio State university, Columbus, O.; F. G. Sefing, M. F. Surls and C. C. Sigerfoos, Michigan State college, East Lansing, Mich.; S. M. Brah, A. B. Clemens, and F. W. Brady, International Correspondence Schools Inc., Scranton, Pa.; H. L. Campbell, W. P. Wood and John Grennan, University of Michigan, Ann Arbor, Mich.; C. H. Casberg, University of Illinois, Urbana, Ill.; O. W. Potter, University of Minnesota, Minneapolis; H. L. Goodman, Cornell university, Ithaca, N. Y.; P. E. Kyle, Massachusetts Institute of Technology, Cambridge, Mass.; R. W. Dayton and C. H. Lorig, Battelle Memorial institute, Columbus, O.; and Oswald Lawson, Windsor Vocational school, Windsor, Ont.; and Frank G. Steinebach, THE FOUNDRY, Cleveland.

Principal addresses were presented by R. F. Harrington and E. H. Ballard. Mr. Harrington emphasized the need of careful adjustment between the scientific and technical viewpoints of the college graduate and the practical viewpoint of the molder and the workman in the problem of adjusting the college graduate to the foundry. He predicted that the engineer would take a more important part in the foundry in the future, and that both the engineer and the management must have a proper attitude toward the problem.

E. H. Ballard pointed out the fact that the great majority of college graduates do not go into the foundry industry and emphasized the importance of giving the engineering graduate a direct understanding of the characteristics of castings as engineering material.

S. M. Brah praised the *Cast Metals Handbook* published by the A.F.A., and suggested that the association continue that type of work in keeping the handbook up-to-date. In this connection, R. P. Schneider related his experience at a conference on welding at which comparisons were made with castings using antiquated data on casting strength.

Methods used at Michigan State college were outlined by C. C. Sigerfoos.

F. G. Sefing discussed the advanced foundry course for engineering students at Michigan State.

A. B. Clemens pointed to the practical impossibility of keeping textbooks up-to-date in view of the rapid progress in foundry technology, and stressed the need for emphasizing basic principles. W. P. Wood also mentioned the *Cast Metals Handbook* and urged more active promotion of junior memberships in the American Foundrymen's association.

According to A. V. O'Brien, all students of mechanical engineering at the University of Iowa are required to purchase A. F. A. handbooks on cast metals. Mr. Casberg stated that copies of the handbook are available for the students at the University of Illinois.

Complaint was registered by O. W. Potter against the constant pressure to introduce additional courses into the engineering curriculum. Mr. Potter stated that the foundry department is not a degree granting department and therefore the instructor is handicapped.

John Grennan traced the history of the A.F.A. foundry instructors' meeting and pointed out what progress has been made since the meetings first were established.

In closing, Mr. Ballard stated that he thought his remarks possibly should have been given before a group of professors in mechanical engineering or engineering design. He thought that a greater effort should be made by the association and by foundrymen in general, to interest the heads of mechanical engineering departments so that they might have a better appreciation of the value of cast materials in engineering construction.

Convention Reports

DUE to the many activities at the recent Detroit convention of the American Foundrymen's association, space limitations prevented the publication of all reports in the May issue of THE FOUNDRY. Therefore the reports of the sand shop control course, the sand research session and the foundry instructors annual meeting are presented in this issue.

Sand Control Shop Course

A WELL attended meeting on sand control shop operation was held Tuesday with J. A. Woody, American Cast Iron Pipe Co., Birmingham, Ala., as chairman. W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J., acted as discussion leader. It was stated that quality and cost are directly connected with molding sand practice. The matter of surface quality was prominent in the discussion.

L. H. Marshall, L. H. Marshall Co., Columbus, O., spoke of the practical aspects of getting quality surfaces on light gray iron castings using green or natural sand, the function of the mold, dry strength, permeability, and cooling action. Charles Schofield, Chevrolet Gray Iron Foundry, Saginaw, Mich., contributed to the discussion on moisture content, standardization of practice and surface quality procedure.

A resume of sand control equipment use was given by M. R. Taggart, Taggart & Co., Philadelphia. A discussion followed on testing equipment use, the point being brought out that the vibratory test shows clearly the silt content in sand. Facing was considered by E. F. Fisher, Illinois Foundry Co., Springfield, Ill., and B. W. Worthington, McWane Cast Iron Pipe Co., Birmingham, Ala., discussed the method employed by his company for the control of moisture content in the sand.

W. H. Spencer, Sealed Power Corp., Muskegon, Mich., acted as chairman at the Wednesday afternoon session on sand control. The discussion was led by A. S. Wright, Hunt-Spiller Mfg. Corp., Boston, who described many of the problems and the methods adopted to solve them over a period of many years. Extent to which conditions have been improved is indicated by the fact that casting losses traceable to sand conditions have been reduced to less than 0.5 per cent. An interesting development of this long series of experiments indicates that under certain conditions bentonite is preferable as a bonding agent, while in other instances more satisfactory results are secured through the addition of other types of fire clay. The statement was made that sand bonded with very rich clay does not hold a moisture content as well as sand bonded with a leaner grade.

Touching on the pulling down of the cope face on certain types of castings, a theory was advanced to the effect that sharp sand bonded with a fine clay cannot expand properly. In proof of this theory it was pointed out that when new molding sand instead of clay was used to rejuvenate the sand heap, the cope did not pull down. A considerable part of the discussion centered about the production of long liners or bush-

(*Concluded on page* 63)

ADVERTISING PAGES REMOVED

(*Concluded from page 60*)

ings weighing from 1500 to 1800 pounds, castings on which only ⅛-inch finish is allowed outside and inside and which must be absolutely spotless. That is to say free from any blemishes or defects of any kind on the surfaces.

It was stated that while a synthetic sand produces satisfactory castings, it requires closer supervision and control than a good grade of naturally bonded molding sand. New sand used in some of the heaps is from an eastern deposit, falling under classification 27 A.F.A., and containing 20 per cent clay. In regard to the disposal or removal of fines it was stated that one sand heap has been in use since 1925 and the fines content has increased only from 2.5 to 3.5 per cent.

Molding sand for steel castings was discussed at the sand control shop course held Thursday afternoon under the direction of George Batty, Drexel Hill, Pa. The session was opened by D. D. Cameron, Pratt & Letchworth Co., Buffalo, who outlined various points for discussion, prefacing his remarks with procedure employed in his foundry. During the discussion mention was made of the use of a green sand in which 24-mesh fireclay with some organic binder was employed. That sand had a permeability of 450, an A.F.A. grain size of 32, and an A.F.A. type classification No. 7. It was a round grain sand containing 5 to 5½ per cent moisture, and was rammed hard.

No difficulty was encountered in its use as the castings were obtained free from pin holes and true to size. Questioning developed the fact that the sand was exceptionally free from any fines due to a cleaning system, and that bentonite clay as a binder had been tried without satisfactory results. Another speaker stated that for successful application of bentonite that a certain amount of fines in the sand was necessary to obtain the desired coating of the sand with bonding material, and due to the fact that the previously mentioned sand was extremely clean, proper distribution of bentonite undoubtedly was not secured.

Castings from 200 to 500 pounds in weight were poured in the fireclay bonded green sand without drying of any kind. Heavier castings were made with the same sand except that the mold face was coated with a silica wash, and then of course the molds were dried. Further discussion of the problem of steel foundry sands related to the application of fine sands in the corners of molds which contrary to common opinion resulted in freedom from pinholes at such points.

While the actual reason for that result was not known definitely, a partial explanation was predicated on the fact that with finer grain sands, less voids were present, and consequently less gas was formed when the molten metal contacted the sand.

Sand Research Is Featured

THE sand research session, under the chairmanship of R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston, to a certain extent constituted a continuation of the earlier session described above. Four formal papers were presented. The first entitled "The Constitution of Bonding Clays and Its Influence on Bond Properties," prepared by R. E. Grim, R. H. Bray and W. F. Bradley, Illinois State Geological survey, Urbana, Ill., was presented by R. E. Grim. The colloid content of the clay is the active agent so far as foundry use is concerned. Typical analyses and other characteristics of various clays were presented and discussed.

In a second paper, H. W. Dietert, H. W. Dietert Co., Detroit, in collaboration with R. A. Dietert, discussed deformation of molding sand. The speaker directed attention to an important point frequently overlooked, namely that as with practically every other material, sand expands under the influence of heat. This expansion takes place rapidly when the temperature suddenly is raised in a mold filled with molten metal. Unless this phenomenon is anticipated and unless proper precautions are observed to meet it, the surface of the mold will work and buckle with resulting scabs, buckles, streaks and other defects on the surface of the casting immediately in contact with the sand.

A paper on practical sand control in gray iron foundries was presented by H. Deane, Deere & Co., Moline, Ill. In discussing the paper after the formal presentation reference was made to a resiliency test developed by H. W. Dietert, which more than any other approaches the hand feel test by which molders of the old school appraised the physical properties of any given sand. The old-time hand test unfortuntely could not be plotted and charted and a man could become proficient only through actual experience, but usually it was highly satisfactory.

The fourth and concluding paper "Foundry Sand Testing Problems at High Temperatures" was presented by P. E. Kyle, Massachusetts Institute of Technology, Boston. In his preamble the speaker explained that the paper was prepared as the result of preparing a course of study for certain students in his institution interested in the subject. In effect the paper represents a compilation, a study and a comparison of the work of various authors who have presented papers at conventions and in the technical papers on this subject.

Discusses Patterns Before Illinois Group

Vaughan Reid, City Pattern Works, Detroit, spoke on "Pattern Making" at the regular monthly meeting of the Northern Illinois Foundrymen's association, held April 14 at the Hotel Freeport, Freeport, Ill. The speaker showed a number of photographs taken at his Detroit shop depicting the layout and arrangement of machinery and the method of handling individual jobs.

Mr. Reid stressed high production and the importance of apprentice training and outlined the method of training used by the City Pattern Works. He gave his methods of selecting materials for patterns and the handling after selection. The point was brought out that a pattern should be of one piece if possible and be as strong as the machine it is to be mounted on. All patterns and core boxes should be checked by plaster cast. Chrome plated cast iron patterns were found to have given the best results on sandslinger work.

President H. S. Bennethum presided at the meeting. F. E. Rundquist, Greenlee Bros. Co, Rockford, Ill., was appointed general chairman of the annual picnic committee. This function will be held June 6 at the Forest Hills country club, Rockford.

Detroit Chapter Has Country Club Outing

Detroit Chapter of the American Foundrymen's association held an outing and golf meet at the Meadowbrook country club on May 21. A short business meeting also was held at which the nominating committee for selecting officers and directors for next year was appointed.

Lieb-Jackson Inc., 337 South High street, Columbus, O., has been appointed representative of the Pennsylvania Pump & Compressor Co., Easton, Pa., in Columbus district.

F. B. Schwartz, 1019 Washington avenue, south, Minneapolis, will represent the company in Minnesota and western Wisconsin.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Wants an Answer

TO THE EDITORS:

I have just read the anonymous letter in the readers' column of the April issue and feel that the conditions cited are general rather than local. About 2 years ago I wrote your paper a similar letter and the firm with whom I was connected upon seeing my name at the end of it, took things to heart and made some improvements; and also *one* in authority made a mental observation to sever my name from the payroll as soon as possible. However, it took two years to do it. So please don't forget to overlook the signature if you care to publish this epistle.

There is today a decided lack of appreciation on the part of foundry owners and executives of the ability and knowledge required of skilled mechanics. We hear men say: "You don't have to know anything to be a molder," yet these same men won't take their coats off and prove their ignorance. Of course, anyone who grew up from the sand heap would not belittle the skills and judgments of the trade. Such remarks come from those who either inherit, marry into, or chisel into these better jobs. A large scrap pile is usually a regular feature in a shop of this kind.

Speed seems to be the predominating factor. Quality comes second and good equipment is so far down on the list that it is hard to tell if they really know that such a thing could exist. And gaggers. If any of your readers, in any part of the world, can offer a good, or a poor, reason why a foundry should go on a hunt for them and finally wind up using soldiers, then for heavens sake let him get out the pen and give me some light.

At the present time I am employed in a good shop as shops go. The foreman is a real mechanic, a square shooter, and a good payer. He employs good molders and all Americans. We have no regular hours and unless business falls off, the working day runs from 10 to 12 hours a day. With so many men out of employment, it seems that industry should be a little more considerate in the matter of adhering to an 8 hour, 5 day week. This is not just a one shop affair. I pass several shops on my way to work and notice similar conditions.

The men don't like these long hours and I know of three good molders that are going to leave the trade and go onto small farms, for just that reason. They figure you only get a living anyway and so many are getting it so much easier, without so much effort, and a lot less grief that the farm is going to claim a lot more *good* mechanics.

Maybe the writer of that anonymous article will get his answer here. Anyway, my shop mates are convincing me that there are easier pleasanter ways of earning or making a living especially where one has some capital.

For over twenty years, I have studied and worked to accomplish something in the foundry trade. I am a graduate of a recognized trade school, a graduate of a course for vocational teachers given by the state department of education and also of McLain's System. Today I find myself just about on a par with a specialty molder who can't write and can hardly speak English, when it comes to getting a job. Maybe you know the answer. I think I do

WAVERING

Old Blast Furnace

TO THE EDITORS:

You may be interested in the accompanying illustration of an old fashioned blast furnace built in 1866 by the Oregon Iron Co., and operated for several years in the little town of Oswego, on the Willamette river about 9 miles south of Portland, Oreg. The furnace had an arch on each of the four sides. Charcoal was used for fuel and the slag ran directly from the cinder notch into the river. In my early days as an apprentice in the Willamette Stove Foundry, Portland, iron from this furnace was mixed with a brand of iron known as Glengarnock which came from Scotland. The Scotch pig iron and fire brick were brought around Cape Horn in the old windjammers.

LEONARD SCHAD

Portland, Oreg.

Blowholes

The following letter from the International Blowhole Corp., recently was addressed to John Grennan, The Scientific Foundry, University of Michigan, Ann Arbor, Mich. Mr. Grennan's thoughtfulness in forwarding a copy to THE FOUNDRY is appreciated.

THE EDITORS

DEAR MR. GRENNAN:

As one of the largest users of blowholes in this area, we have classed you as one of our potential customers. We sent our ace sales engineer to see you last Saturday, and regret he was unable to contact you. It is gratifying to know that you are one of the pioneers in this art, and we know that you will be interested in a brief description of our stock.

We stock in Detroit vast quantities of blowholes, ranging from mere pinholes to those the size of ratholes in both graded and assorted sizes. We also have a complete stock of cold shots and hard spots which you use continually in supplying the machine shop.

As you know, the trend is toward lighter castings. Our blowholes will lighten the castings greatly and in this manner permit you to use less iron in the furnace and earn better profits.

The hard spots are also an improvement perfected by you in your miracle foundry. We have heard from the machine shop that these hard spots of yours are so near perfection that they will withstand the cutting action of the best tools, and either break the tool or wreck the machine.

We consider your fabrication of 20 per cent hard spots combined with your lighter-than-aluminum iron castings, one of the true advancements of the times.

INTERNATIONAL BLOWHOLE CORP.

Detroit

Know the Fighters

Name-on-Request c/o THE FOUNDRY

If Dan Avey's (whang) editorial that opened the March issue could reach enough responsive spirits like your own, half of our battle if not more would be solved.

You display the spirit of Napoleon so I assume you are short (and being in the foundry business) thin—and since you have been in the foundry business from 1929, whether you

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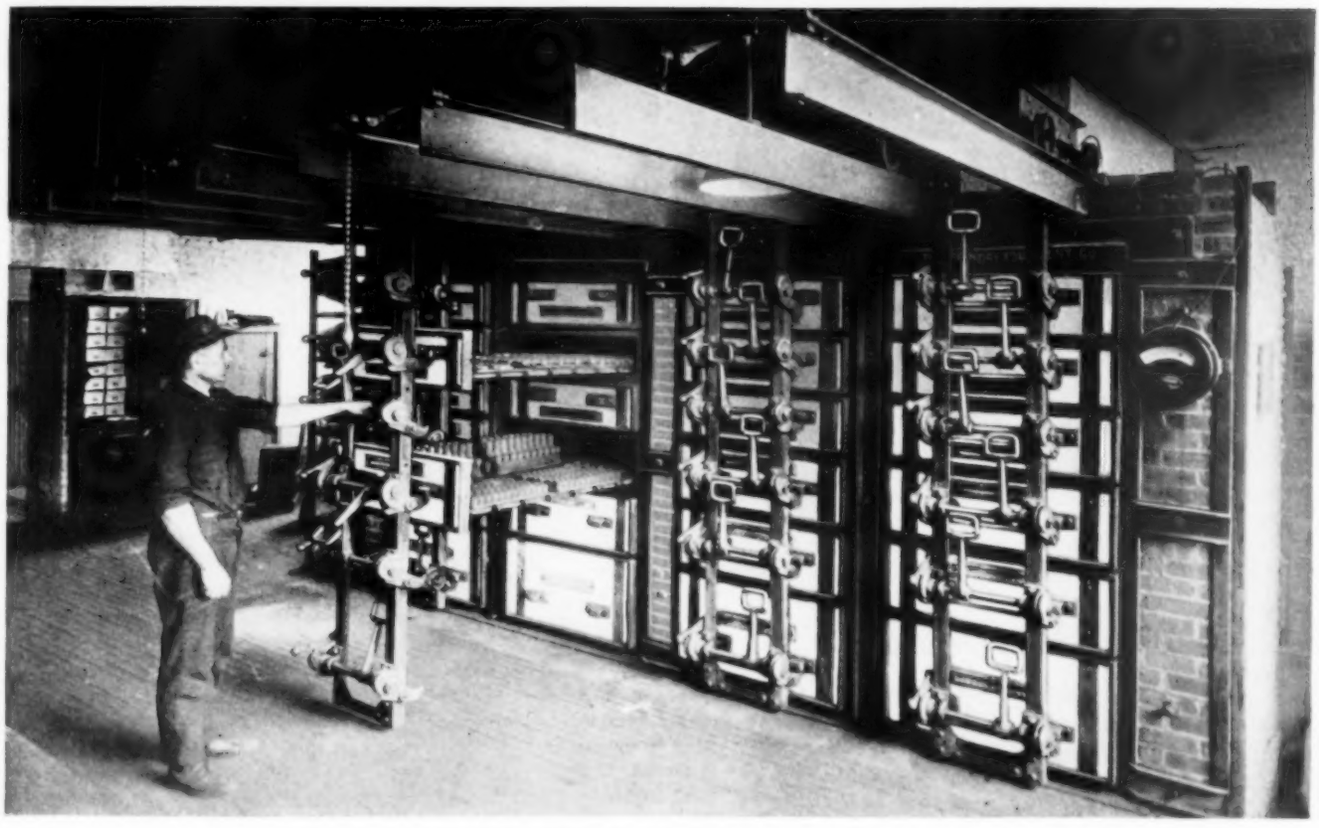
Coleman Rolling Drawer Core Ovens



Four COLEMAN Rolling Drawer Core Ovens fired by single oil burner.

THESE ovens are practically continuous core-baking machines. One or more drawers can be loaded or unloaded while the cores in the remaining drawers are being baked. Automatic closing plates prevent the escape of heat and gases.

Particularly suited for small and medium work, and will turn out more work for floor space occupied and fuel consumed than can be obtained by any other type of oven construction.

Patented double-suspension ball-bearing drawer pullers provide easy, vibrationless operation of even the most heavily loaded drawers.

Drawers run inside the oven on differential frictionless, self-aligning rollers which require absolutely no lubrication, regardless of oven temperatures.

Coleman Ovens are a product of thirty years' specialization in core baking and mold drying. Over 4000 COLEMAN OVENS in successful operation in leading foundries everywhere.

BUILT IN ALL TYPES AND SIZES—
Vertical and Horizontal Conveyor, Rack, Car, Rolling Drawer, Shelf, etc.

FOR OPERATION WITH ANY FUEL—
Gas, Oil, Coke, Stoker-coal, Powdered-coal, etc. Direct-fired and external recirculating heating systems.

WRITE FOR COMPLETE CATALOGS

The FOUNDRY EQUIPMENT Co.

BUILDERS OF COLEMAN AND SWARTWOUT OVENS
CONTRACTING ENGINEERS AND MANUFACTURERS

C L E V E L A N D • O H I O

(*Continued from page* 64)

were light or dark at the start you are probably gray now, and since age is purely a matter of mental attitude you are young enough to supply what the industry needs.

I have been trying by personal contact with the aid of a few fine foundrymen to sell the spirit that's in your heart. We talk of going to the "dry-cleaners" when a concern is all washed up, and I am chagrined to think that there are such a large number among 5,000 foundrymen who not only imitate dry-cleaner in their price practice, but are apparently definitely determined to join them.

Personally, I'd like to know who you are and where you are, to be held in whatever degree of confidence you desire. We have a fight on our hands and one must know where the fighters are entrenched.

I expect to be at the Convention in Detroit during the week of May 4, and if you are there it will be a pleasure to extend a personal hand.

ELIOT ARMSTRONG
Inter-Allied Foundries
70-86 West Chippewa St.
Buffalo, N. Y.

Chill Oil

TO THE EDITORS:

Our attention recently was called to an item in the Question and Answer department of THE FOUNDRY regarding difficulty in obtaining smooth surfaces on chilled areas of gray iron castings. In your reply you gave an excellent explanation of the causes of chill roughness, but stated that: "In many instances it is sufficient to spray, rub or brush a thin coating of oil on the face of the chill. Practically any kind of oil will serve."

It has been our experience that results vary decidedly according to the type of oil used. After considerable practical and experimental work several years ago we developed a special oil for this purpose. For several years this product has been used exclusively by many large car wheel manufacturers.

The first step in preparing this oil for use is to heat it to a temperature of 212 degrees Fahr. This is important, as all moisture that accidentally may have found its way into the oil in storage or during shipment must be removed. After 2 or 3 hours at this temperature the oil is ready for mixing with red iron oxide. The pigment is mixed with the oil in the proportion of 12½ pounds to one gallon of oil. The ingredients should be mixed thoroughly. The compound should be rubbed thoroughly into and over the entire chill surface to insure a uniform thin coating. Butcher's cloth is the best material for this purpose. It is impervious to moisture absorption. All moisture, dust or dirt or other foreign material must be removed from the chill surface before the compound is applied.

The principal function of the compound is the lubrication of the chill face to facilitate the flow of the molten iron. The iron cools and sets rapidly and unless lubrication is provided, the finished casting will show a rough surface due to the uneven flow of the metal. Previous to use the red iron oxide should be stored in a heated place. Many foundrymen employ the core oven for this purpose. The moisture item is extremely important and must be watched carefully.

W. P. HEADDEN
Standard Oil Co., of New Jersey
26 Broadway, New York

G-Metal Castings

TO THE EDITORS:

I saw in the April issue where some one was up against making government castings 88-10-2 or G metal known to foundrymen. I have made tons of government castings which always exceeded the tensile specification. Some of the pieces weighed cleaned 2400 pounds and were not spongy. We tested each for soundness. In connection with the present problem, I would suggest the openness of the sand be looked after. If made in green sand, look out for the amount of water used. One of the most important things is the melting of the metal. Be sure not to charge more than can be covered with charcoal. Otherwise the copper will absorb the gas from the fuel.

In regard to adding the mix, I always charge the zinc 5 minutes before the crucible is to be taken out of the furnace. After removal of the crucible from the furnace charge the tin and stir well. In using nickel the easiest method and one of the best is; melt 10 pounds of tin, remove it from the furnace, and without getting the tin too hot, stir in half the amount of nickel. The tin will dissolve the nickel rapidly, this protecting it from oxides.

Twenty-five test bars in one heat tested all went over 40,000 pounds per square inch tensile.

W B. JONES
Springfield, Mass.

Harmful Methods

TO THE EDITORS:

I have just received your letter of May 28 announcing that the plan to have a joint foundry exhibit at the Great Lakes Exposition had been abandoned. It seems a great pity that the gray iron foundry industry is to be so meagerly represented, but I believe it is directly traceable to its slow recovery from the non-profit basis it has been operating on for the past 4 years.

This situation worries me not a little. The rise in costs of all materials has not been reflected in the price of castings nor has increased taxation. The result has been that the purchaser of castings has gained the impression that the foundry was making so much money during normal times that it has been possible to absorb these added costs without increasing prices and drives for still lower prices with renewed vigor.

You know and I know that it is fear and not previous prosperity that causes this situation. We also know that it works harm to the customer as well as the foundry because the latter must cover himself or else go out of business. When the payroll had been cut to an irreducible minimum quality must follow which acts to discredit the material and further reduce its market.

The only answer lies in driving to stiffen the industry's spinal column to that point where it will learn to say "no" to unprofitable business.

W. W. ROSE
Executive Vice-President
Gray Iron Founders Society
Cleveland

EDITORS NOTE: An attempt to provide an operating foundry to be combined with exhibits of all classes of castings to constitute a feature of the Great Lakes Exposition in Cleveland, June 27 to Oct. 4, proved unsuccessful. Plans were prepared by the Austin Co., Cleveland, and many manufacturers of equipment expressed their willingness to loan machinery for the exhibit, but it was impossible to secure underwriting of the estimated $50,000 cost.

Knows the Answers

TO THE EDITORS:

Am enclosing a numbered sheet with answers as follows: First of all I wish to inform you that all I am selling are aluminum castings.

1. Very few salesmen.

4. I do not really know of any salesmen.

5. My competitors have no salesmen. All their clerks do, is to ask the prospects if they use aluminum castings and they bring the samples back to the foundry for quotations. If the buyer informs them that their price is too high, then they report to their boss who refigures. Do you call that salesmanship? I could do that with a grammar school boy.

6 and 7. Most foundry officials are poor salesmen.

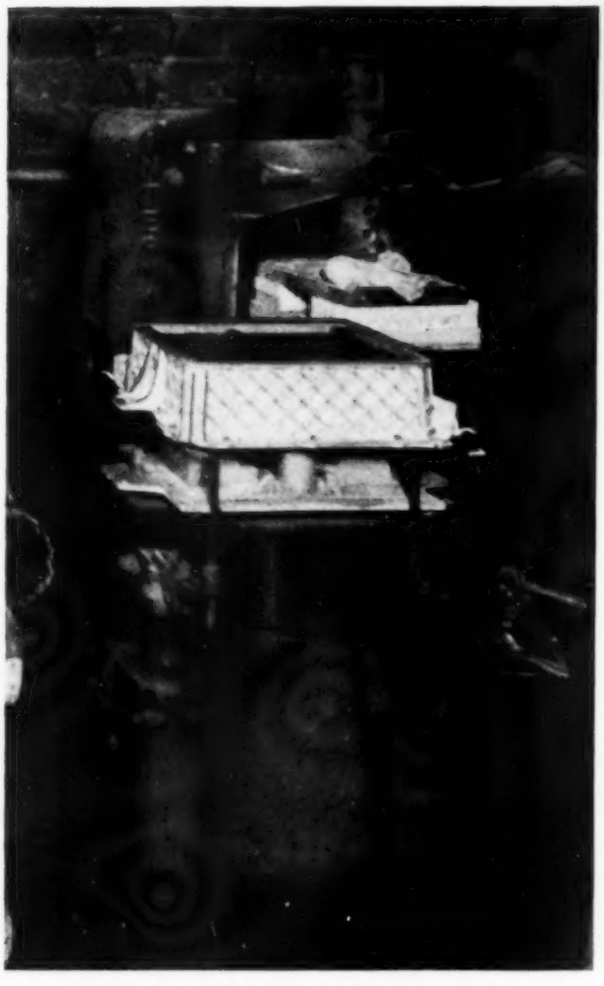
8. Not if they had good ones.

9. My being a salesman has no

(*Concluded on page* 68)

Type G Jolt ram Power Turnover Foot Draw Machine

Type LJSD Double Head Jolt Squeezer



Type PKL Jolt Squeeze Strip Machine

When you select your MOLDING MACHINES from the **INTERNATIONAL** Line you are assured of getting the RIGHT machine for EVERY job because we build

65 Standard Types for Castings

14 Standard Types for Cores — including 3 designs of *Blowers*.

Many Special Types for work of unusual character.

INTERNATIONAL MOLDING MACHINE CO.

2608-2624 W. 16th St. — Chicago Illinois

(*Concluded from page* 66)

effect on price cuttings. I do not aim to beat the other fellow's prices.

10. No there would not.

11. Personnel would be more highly paid.

12. Results are what count. Why educate the next fellow? He wouldn't follow your advice anyway.

13. Price is always my last consideration.

14. No.

15. Yes, selling castings is decidedly a profession. How many salesmen can get higher prices than his competitor? How many are there who can quote on the spot or talk scientific founding? You answer that question.

A. ROSSET, *Chicago.*

EDITOR'S NOTE: The reader's listing of the questions from the editorial in THE FOUNDRY for March are as follows:

1—How many salesmen are there in the 500 foundries of America? 2—How many can any of you foundrymen name? 3—If each of the readers of THE FOUNDRY sent us the names of salesmen in the foundry industry, how long a list would we have? 4—Do any of you know one hundred, a dozen or even five? You know your competitors. 5—Are their salesmen price cutters? 6—If their presidents do the selling (so called), are they salesmen? 7—Are their vice presidents or managers, salesmen? 8—Would ninety per cent of the foundries be short of money if they had salesmen? 9—Would everyone else be a price cutter if you were a salesman? 10—Would there be so many antiquated jobbing shops, so much obsolete equipment, such poor appointments in shops and offices if there were more salesmen? 11—Would foundry personnel be a low or highly paid class if castings were really sold? 12—What new or old, but compelling, sales arguments are ever presented to users of castings to get them to buy from you or any other foundry? 13—What do you stress except price? 14—Is a foundry executive who grew up through the sand pile, coreroom, office, college or entered by inheritance from an ancestor necessarily a salesmen? 15—Or is selling castings in the same class as any other line where expert salesmanship is a profession?

Opens Branch Office

Chicago Pneumatic Tool Co., New York, has opened a branch sales and service office at 2415 Commerce Street, Dallas, Tex. D. G. Reeder is district manager.

That company also has moved its Pittsburgh office to 810 Chamber of Commerce building.

Ohio Foundrymen Hear Cupola Discussion

Speaking on gray iron cupola practice before the Northeastern Ohio Chapter of the American Foundrymen's association at the Cleveland club, Cleveland, Thursday, May 21, Fred J. Walls, International Nickel Co., New York, stated that in his opinion, the big tonnages of iron would continue to be melted in the cupola for many years to come. Many of the old inhibitions, traditions, rule of thumb and guess work have been discarded. Cupola operation in the majority of instances now is conducted on a scientific basis. However, he pointed out that while many of the factors have been standardized, a sufficient number of variables still remain to engage the close attention of the operator. A nice balance must be maintained between the various ingredients entering the cupola, iron, fuel, flux and air.

Marked chemical reactions take place in the cupola and naturally these reactions will vary depending on the materials employed. For example the loss of silicon and the carbon pickup will vary to a considerable extent depending on blast volume and pressure. Replying to a question from the floor the speaker stated that up to the present no method has been developed to show what proportion of the air entering the cupola is converted to CO or CO_2. Touching on the improvement in refractories in recent years, he pointed to the performance of many cupolas running on all day heats and melting from 400 to 600 tons of iron. Other topics included function and characteristics of slags, theory of combustion, hot blast, high and low blast pressures and melting capacities.

An interesting feature of the evening was the presence of the graduating class in foundry work of the Cleveland Trade school. Two of these young men, Edward Holy, employed by the Aluminum Co. of America, and Michael Kling, employed by the Lake City Malleable Co., were winners in the recent apprenticeship contest staged by the American Foundrymen's association in Detroit. Mr. Holy was awarded first prize in the patternmaking and Mr. Kling won second prize in the gray iron casting division. Certificates of award accompanied by checks for $40 and $25 respectively were presented to the boys by Dan M. Avey, editor of THE FOUNDRY and retiring president of the American Foundrymen's association.

Choice of the nominating committee for officers of the Northeastern Ohio Chapter of the American Foundrymen's association for the coming year was confirmed by unanimous vote as follows: Chairman, Frank G. Steinebach, managing editor, THE FOUNDRY, Cleveland; vice chairman, Bertram G. Parker, president, Youngstown Foundry & Machine Co., Youngstown, O.; secretary-treasurer, Russell F. Lincoln, assistant sales manager, Osborn Mfg. Co., Cleveland; director, term expiring 1937, J. Ward Henry, Electric Alloys Co., Elyria, O.; directors terms expiring 1939, Homer Britton, Cleveland Cooperative Stove Co., Cleveland; E. F. Hess, Ohio Injector Co., Wadsworth, O., Walton L. Woody, National Malleable & Steel Castings Co., Cleveland.

Philadelphia Group Visits New Jersey Plant

Members of the Philadelphia Chapter of the American Foundrymen's association visited the plant of the United States Pipe & Foundry Co., Burlington, N. J., on May 27. The men saw three shops which were built in 1875 and which have been used for the manufacture of cast iron pipe continuously since that time.

A shop housing the special foundry for the manufacture of fittings of various types from three inches to 84 inches was visited, and a pattern shop depicting modern storage, equipment and methods was seen. The centrifugal shop where pipe from 2 to 24 inches in diameter and 12 to 18 feet in length is manufactured afforded an opportunity for the men to observe the differences in various types of manufacturing methods.

Book Review

Transactions of the American Foundrymen's Association, cloth, 624 pages, published by the American Foundrymen's Association, Chicago, and supplied to members for $2.00 and to nonmembers for $8.00.

This volume contains a summary of the proceedings of the thirty-ninth annual meeting of the association, held in Toronto, Aug. 20-23, 1935, the minutes of the annual business meeting, and the various meetings of the board of directors held throughout the year.

A major portion of the book is devoted to the technical papers presented at the Toronto meeting, together with the written and oral discussion which followed the various presentations. The technical papers include a symposium on "The Influence of Temperature Gradients in the Production of Steel Castings", and one on "Industrial Health Hazards and Employer Responsibility". Reports of several committees also are included.

ADVERTISING PAGES REMOVED

European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Resists Chemicals

Cast Iron in the Chemical Industry, (*La Fonte dans l'Industrie Chimique*) by Andre Guedras. *La Revue de Fonderie Moderne*, Paris, December 10, 1935.

After mentioning the progress made possible in preparation of special cast iron by the use of the electric and rotary furnaces, the author explains the action of electric couples on cast iron, this action being the origin of attacks by chemical reactions.

The action of chemicals on cast iron is then reviewed. Hydrochloric acid attacks all ferrous products; sulphuric acid at 60 per cent concentration does not attack cast iron to any extent at ordinary temperatures; nitric acid, when diluted, strongly attacks cast iron; as regards organic agents, many attack cast iron, and it is then necessary to use enameled cast iron, and sometimes iron with a lead coating. Generally speaking, all chemical agents attack ordinary gray iron to a greater or lesser extent.

Cast iron can be made to resist chemical action by the incorporation of special alloys, such as silicon, nickel, chromium, molybdenum. Small additions of silicon, up to 3 per cent, tend to increase the attack by acids, but with a high silicon content, iron will resist better, even to hydrochloric acid; iron with very high silicon is difficult to cast.

To resist the action of sulphides, a composition is given, containing a percentage of silicon, chromium, nickel and copper, which gives an austenitic iron. By increasing the silicon and chromium content, the resistance to oxidation is increased.

Action of molybdenum as an addition is to refine the carbon in the cast iron and to favorize martensitic structure; with iron containing a fair amount of silicon, it refines the pearlitic structure and gives the iron better machining qualities.

For corrosion-resisting cast iron, nickel is recommended, but the addition must be at least 10 per cent. Against chemical agents, chromium and copper should be added as well as nickel. Additions of from 0.5 to 2 per cent copper to irons containing manganese and silicon, increase resistance against hydrochloric and sulphuric acids. Antimony also can be used, but from about 2 per cent it considerably increases the brittleness of the iron.

Steel Cylinders

Manufacture of Cast Steel Cylinders for Locomotives. (La Fabrication des Cylindres en Acier Moule pour Locomotive) by E. Lecoeuvre. *Bulletin* de l'Association Technique de Fonderie, Paris, January, 1936.

This is the text of a lecture given to the members of the French foundry association, which gives a complete description, with 72 illustrations, tables and charts, of the process of manufacture for locomotive cylinders in cast steel. The author is foundry manager at Anciens Etablissements Cail, an important locomotive works in the north of France.

The article is divided into nine chapters, the first of which covers the preliminary study of the casting, taking account of contraction, differences of thicknesses, preparation of the cores, position of gates, heads, and providing for all tools and equipment required for making a given type of cylinder.

The second chapter deals with the study of the patterns with the calculation of contraction; details are given on the actual method of making the patterns, with indications as to core prints and the manner in which the cores are placed in the molds. Chapter III describes the flasks, tools and gages required for molding.

The fourth chapter gives details relating to molding sand requirements, with charts and tables for porosity, compression, grain size, chemical composition. The composition and tests for core sands are also covered. Chapter V goes into the details of the various types of cores required, with drawings and methods of preparation. The sixth chapter covers molding operations, and the seventh the placing of the cores in the mold.

The eighth chapter deals with the preparation of the metal; Chapter IX deals with the heat-treatment of the casting.

Eggshell

A Foundry Defect: The Eggshell. (Un Defaut de Fonderie: La Coquille d'Oeuf) by Guy Henon. *La Revue de Fonderie Moderne*, Paris, Jan. 25, 1936

The author has investigated a defect that was brought to light by D. Rogers in THE FOUNDRY for December 15, 1927. This defect, which arises mostly in the casting of ingot molds and of semisteel shells, takes the form of a film of 0.5 to 1 millimeter in thickness, which is found at the rounded corners of the core. The author calls this defect the *eggshell*.

The author explains the formation of this defect as being due to expansion of the metal when at the same time there might be a contraction of the core; this creates a void where unsolidified metal contained in the head of the casting may find its way; it then solidifies in the form of a film.

J. Varlet has shown that molding sands and core sands are subject to certain fluctuations of expansion and contraction over a range of temperatures.

The author has verified the theory on a shell; a chemical and micrographic analysis of the metal of the shell and of the film shows considerable accumulation of phosphorus in the metal of the film, showing that this film is formed from metal that was last to solidify. Another verification of the theory was made on a vat. The dilatometric examination of the iron and of the core sand confirms the theory, and here again the film contained an accumulation of phosphorus.

To avoid the defect, several remedies are indicated:—

(a) To render the casting watertight and uniform. This method was suggested by D. Rogers. To enable the angles of the casting to solidify rapidly, those parts are cooled by inserting in the core tubes filled with cold water.

(b) To reduce the size of the space forming between the casting and the core by acting on the composition of the iron or of the core. J. Varlet has made useful suggestions on that point.

(c) To render solidification isothermic by a correct calculation of the head and by top pouring.

(d) To reduce the interval of solidification by using irons with the lowest possible phosphorus content, 0.08 per cent being considered as a maximum.

Safety Congress Holds Foundry Session

Problems pertaining to workmen's compensation and good housekeeping practices featured the foundry sectional meeting of the seventh all-Ohio Safety congress held at the Deshler-Wallick hotel, Columbus, O., Wednesday morning, June 3. George J. Leroux, National Malleable & Steel Castings Co., Cleveland, and chairman of the section, presided over the session.

In discussing "The Foundry and the Compensation Law", J. W. Beall, commissioner, the Industrial Commission of Ohio, Columbus, stressed the absolute necessity of supplying the Industrial commission with all facts concerning all accidents in industry. The employer, of course, is interested in knowing what happened to cause the accident, but the commission wants to know what happened to the man. Mr. Beall advised employers to see that hereafter all facts concerning an accident are obtained immediately after such a misfortune happens, and that these facts are made a part of the official record.

The speaker stated that all of the information used by the commission is documentary and therefore it is of vital importance that the facts are complete. As a sidelight, he pointed out that in 400 claims filed with the commission every half day, an average of 85 must be returned to the companies making out the reports, due to incomplete information. The efficiency of the commission organization is illustrated by the fact that 92 per cent of all claims filed are disposed of within 10 to 20 days from the date of filing.

Prey on the Victims

Mr. Beall criticized the situation which permits the ambulance chasing lawyer and the unscrupulous doctor to prey upon the victims of industrial accidents. He stated that too many people take the opinion of any doctor as absolute fact, forgetting that doctors are human and can make mistakes as well as anyone connected with industry. The speaker said he would remove from the payroll any doctor who would tell a man he could not be rehabilitated. He also pointed out that professional men can be found who are unscrupulous and sufficiently mercenary to testify to anything that may be asked of them, just to secure a fee.

The commissioner also stated that in many instances, a so-called accident is only the discovery of a condition that has been in existence for a long time, but the man has had no knowledge of the difficulty. While it is the desire of the commission that men working in industry get all of the compensation to which they are entitled, the commissioner does want men to be educated as to just what constitutes a compensable accident. In any claim, it must be shown that something did happen, out of the ordinary, and constituting a specific accident.

Mr. Beall closed with a warning against the chronic accident victim. He believes that if a man does not protect himself, he should be transferred to another department where hazards do not exist, or removed entirely from the payroll. This should be done in justice to the man's family. If it is necessary to use harsh measures to get results with the repeater, Mr. Beall believes in getting results.

E. O. Jones, director, safety and hygiene section, American Foundrymen's association, Chicago, presented an interesting and valuable discussion of good housekeeping practices in a paper "It's Housecleaning Time in the Foundry." Mr. Jones pointed to the progress which has been made in the development of foundry equipment for the protection against dust, and stated that the purchase of such equipment is only a part of the job. The employer should adopt all means of prevention, and at the same time the employe, who elects at his own option to work at a certain trade, should recognize his personal responsibility to minimize the hazards, when known to exist, by using protective devices supplied by the employer.

In starting any good housekeeping program, Mr. Jones suggested the removal of everything that is not needed in the production of castings, and which might be placed in the category of dust and dirt catchers. Molders' benches should be cleaned up and all excess materials removed. Racks should be provided for the various supplies such as gaggers, clamps, etc., as well as for slings, chains and other equipment used in the shop. Surplus sand should be removed from corners or any other place where it may have been allowed to accumulate. Molders should not be allowed to remove dust from benches or machines with air hose or to clean clothing by that means. All floors should be wet down thoroughly before being swept. Success in any good housekeeping program requires selling from the top down.

Check Ventilation System

Following the general clean-up of the foundry, Mr. Jones suggests the survey of equipment, starting with existing ventilating systems. It should be ascertained whether the systems are of proper size and design to collect effectively the dust at the source of operation. All piping should be checked to make sure there are no holes, and to determine if the piping is of proper size. Mr. Jones also discussed the steps which should be taken in connection with tumbling barrels, chipping operations, blasting, etc. He pointed out savings which can be accomplished in connection with the use of compressed air.

In conclusion he stated that prevention of conditions which are contributary to the contraction of disease, and the control of such conditions as may encourage or augment it, in other words, good housekeeping, should be the earnest endeavor of management at all times.

Mr. Leroux was re-elected chairman of the foundry section for the coming year, and James R. Byrum, American Rolling Mill Co., Middletown, O., was re-elected vice chairman.

An exhibit of safety equipment and supplies was held in connection with the congress, which extended from June 1 to 3.

Praised for Progress

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION received this brass medalion for its efforts toward the revival of sales. The award was made to Herman H. Lind, general manager of the association, by the American Trade Association Executives at its semiannual meeting in Washington April 28. Courage of the Machine Tool association as displayed by its successful show in Cleveland last September, and its drive to create more favorable business conditions won praise from Secretary of Commerce Daniel C. Roper, who made the presentation.

Talks on Malleable Iron

J. A. Durr, director of research, Eastern Malleable Iron Co., Naugatuck, Conn., gave a nontechnical talk on malleable iron before the Connecticut Foundrymen's association at a meeting held at the Home club, Meriden, Conn., May 15.

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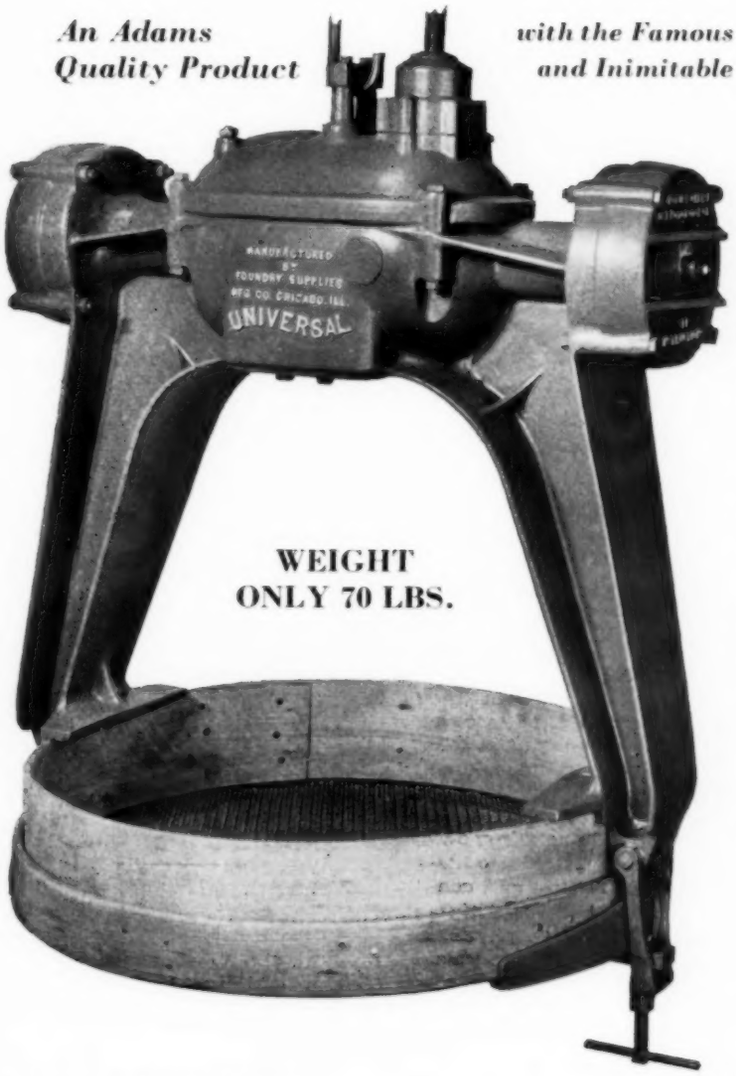

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Unequalled where speed and accuracy are essential. A production as well as laboratory instrument. Sieves stay clean throughout the test, last much longer because no lead shot required to force sand through. Sold nationally at $200.00* f.o.b. Chicago.

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Develops a New Type of Enclosed Hinge

Among the claims advanced for a new type of hinge or knuckle joint recently developed by J. F. Hines Mfg. Co., Cleveland, are that it is stream lined, smooth, sagless, squeakless, dust proof and water proof and is cast as a unit. The hinges may be cast readily in aluminum, brass, malleable iron, steel, high test iron, bakelite, hard rubber or any other metal or plastic material. They may be made in any size or shape for use on sea going vessels and railroad rolling stock, agricultural and general machinery and building hardware. Details of construction are shown in Fig. 1.

The principle is adapted for casting chains in aluminum, brass, malleable iron, steel or other metal as shown in Fig. 3. The chain may be endless as shown, or provided at either end with special links, hooks or other device. The chain is flat and may be wound on a drum. The joint between the links is an assembled unit of steel rod and brass tubing. This unit is placed in a prepared die or mold and the molten metal is poured around it. This arrangement insures a regularity, accuracy and low cost. When the chain is shaken out of the mold it is ready for use.

Hinges are molded and cast in pairs. Large chains are made in the same manner, but the smaller chains are made from a pattern containing from 6 to 12 links depending on the accommodation in the flask. The method of forming the joint is the same in all cases A brass sleeve *G* and brass washers *H* and *K* are placed on the steel rod *F*. The assembly then is placed in the green sand mold. The washers are pierced with several small holes for anchoring the metal. The washers also act as stopoffs and prevent the metal from one link, or one leaf of the hinge from flowing into the mold for the other link or leaf. Thus when metal flows into the left member *A* it also fills sections *G* and *D*, grips

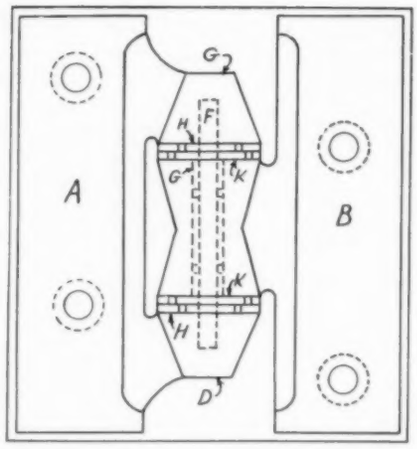

Fig. 1—General view of hinge showing position of pin, sleeve and washers

the ends of the steel rod *F* and anchors the washers *H H*. Metal entering the right member *B* flows into the center section *E* and is anchored to the sleeve *G* and the washers *K K*.

Durability of Molding Sand Discussed

The engineering experiment station, University of Illinois, Urbana, Ill., has compiled information concerning its investigation of the durability of molding sand, in a recently published bulletin No. 281. Written by Carl H. Casberg and Carl E. Schubert, in co-operation with the American Foundrymen's association, it outlines apparatus and methods used in the determination of permeability, compression strength, shear strength, tension strength, etc., of various molding sands and gives the results of the tests made. Mineralogy and chemistry of different bonding substances in molding sand is a major part of the discussion and definite results and conclusions of this interesting investigation are correlated with the physical and chemical properties of minerals. A bibliography is another feature. The bulletin may be purchased from the university for 60 cents.

Quad City Group Holds Annual Election

The May 18 meeting of the Quad-City Chapter of the American Foundrymen's association was held at the LeClaire hotel, Moline, Ill. Principal speaker was Leroy P. Robinson, Werner G. Smith Co., Cleveland, whose talk was entitled "Some Common Sources of Core Room Troubles."

Mr. Robinson emphasized fundamentals of core making such as the selection of sand, various types of binders, mixing and mulling and moisture control. Using concrete examples to illustrate points in his talk, he also dealt with the subjects of venting of cores, baking and inspection. Lively discussion followed this interesting talk.

Men nominated as officers for the coming year at the previous meeting were elected as follows: T. J. Frank, Frank Foundries Corp., Moline, chairman; M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill., vice chairman; J. Morgan Johnson, Moline, secretary-treasurer. The board of directors includes P. T. Bancroft, H. Bornstein, F. W. Kirby, J. H. Ploehn, C. F. Scherer, A. E. Hageboeck, H. F. Henninger, Clyde W. Burgston and E. A. Gullberg. Mr. Hageboeck was elected a trustee for 3 years, Mr. Ploehn for 2 years and Mr. Bornstein for 1 year.

Mr. Ploehn, chairman of the Tri-City Manufacturers Educational committee, spoke on apprentices and apprentice training in the surrounding area, after which he presented local prizes in pattern making and molding. Two Quad-City apprentices, George Daufeldt and John Bloomquist, received national prizes at the Detroit convention in molding and pattern making respectively.

Beeman Combustion Supply Co., 2970 West Grand boulevard, Detroit, has been made engineering sales representative of the Industrial Furnace division of Philadelphia Drying Machinery Co., Philadelphia, in the Detroit territory.

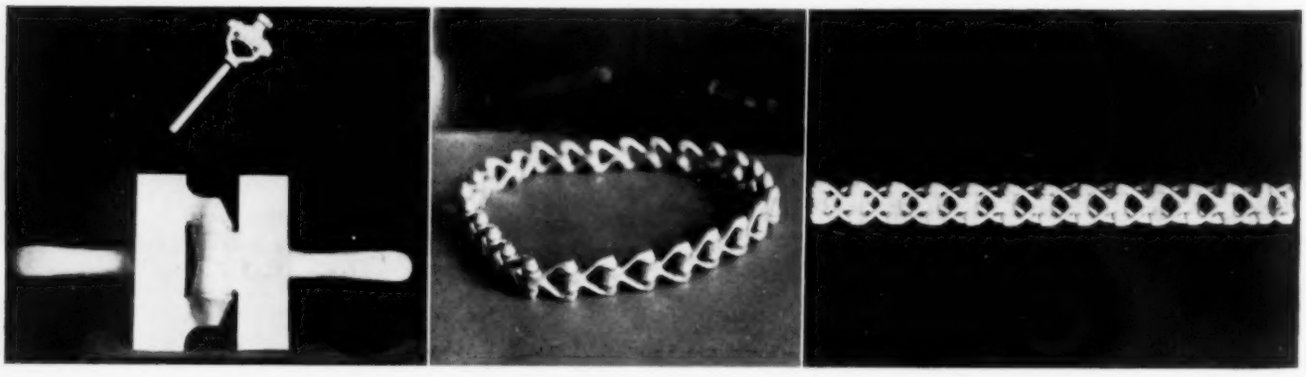

Fig. 2 (Left)—Hinge open, and above application to special swivel joint. Figs. 3 and 4 (Center and right)—Typical lengths of endless chain readily made to any desired length

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General Meeting Held in New England

A. S. Wright, president of the New England Foundrymen's association, gave a general synopsis of the happenings and highlights of the Detroit convention at a general meeting of that association, held May 13 at the Engineer's club, Boston. A brief summary of the papers presented at the convention was given by R. F. Harrington. He enlarged on various points of interest with reference to alloys and insulated ladles and concluded his resume by advising all present to read the reports of the committees on foundry practice, specific applications and heat treatment, explaining that these refer particularly to alloy cast iron.

H. S. Bartholomew explained a new process for cams which has been developed by the United Shoe Machinery Corp., Boston. Hot quenching the cast iron at 600 degrees is the fundamental principle of this process. Mr. Bartholomew cited various examples of the increased life of these cams as tested by the Massachusetts Institute of Technology.

E. Van der Pyl, Norton Co., Worcester, Mass., presented a paper on "Boron Carbide Products," dealing mainly with the application of boron carbide for sandblasting nozzles. He spoke of the manufacture of boron carbide and stated that it was the hardest material produced by man.

Iron and Steel Institute Holds Meeting

The British Iron & Steel institute, at its annual meeting held May 7, re-elected the following vice presidents: Alfred Hutchinson, 48, Lee terrace, Blackheath, London, S. E. 3; John Craig, 195, West George street, Glasgow; H. Spence Thomas, Thomas Bros. Ltd., 5, St. Helen's place, London, E. C. 3. As members of the council, the following members were re-elected: the Right Hon. the Earl of Dudley, chairman of the Earl of Dudley's Round Oak Works, Ltd., Dudley, Worcestershire; Capt. R. S. Hilton, 17, Westbourne road, Sheffield; I. F. L. Elliot, 66, Cannon street, London, E. C. 4; E. F. Law, Parliament Mansions, Victoria street, London, S. W. 1; Dr. T. Swinden, director of research, the United Steel Companies, Ltd., Sheffield.

Among the papers presented was one by H. J. Tapsell, Dr. M. L. Becker and C. G. Conway, National Physical Laboratory, Teddington, on "Behaviour of Five Cast Irons in Relation to Creep and Growth at Elevated Temperatures." Results of the investigation show that rates of creep and growth of ordinary gray cast iron and nickel-chromium cast iron may be reduced considerably by preliminary heat-treatment below the critical temperature for a suitable period, and, for that reason, these irons in the heat-treated condition may have additional useful application. The investigation was made on ordinary cast iron, nickel-chromium cast iron, silal, nicrosilal, niresist.

The discussion was opened by J. G. Pearce, director, British Cast Iron Research association, who said that, in his opinion, this was the most comprehensive paper on creep in cast iron as yet published in any country. He pointed out that the demand for special irons is for temperatures higher than those used in the paper. He also stated that the remark made in the paper that silal growth is similar to that of ordinary iron after heat-treatment shows that the growth for silal is the same as for ordinary cast iron when growth has actually taken place.

W. T. Griffiths, Mond Nickel Co., Ltd., London, expressed regret that the irons investigated in the paper had been termed *typical* irons, as certain results show that they do not behave as *typical* irons—such as are used for heat-resisting purposes. Referring to the method of counteracting the effect of chromium by raising the silicon content, the speaker stated that there are other ways of arriving at the same result. He said that with austenitic irons it seems that if the silicon content is increased, other modifications should be made to other components.

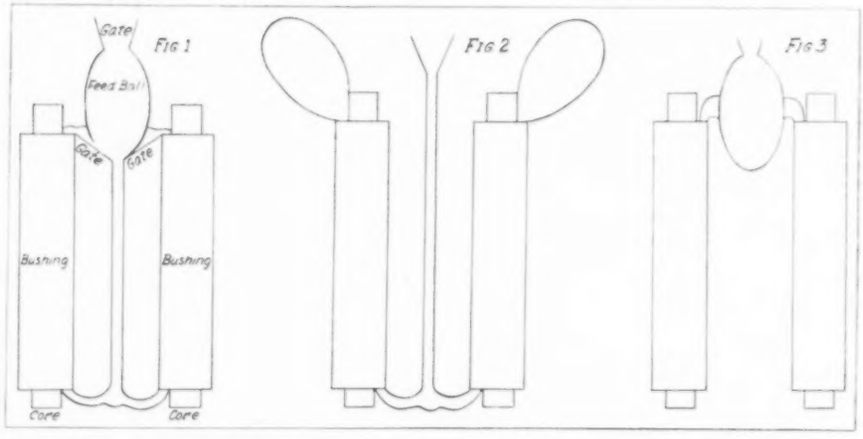
Discusses Sands

A recent issue of "Sands Clays and Minerals," published by Algernon Lewin Curtis, Westmoor Laboratory, Chatteris, England, contains a number of articles of interest including the following: "Efficiency of Heat Absorbing Glasses"; "Minerals for Coloring Glass and Enamel"; "Industrial Diamonds and Their Uses"; "The Use of the Spectograph in Industry"; "Molding Sand Testing Apparatus."

Right and Wrong Way to Gate Bushings

By Gus Burns

The gating method plays an important part in the production of clean, solid bushing castings. The accompanying illustration shows three methods for gating small bushings molded two in a flask horizontally from split patterns and then turned up on end for pouring. Of the three, the method shown in Fig. 1 is the only one that can be depended upon to produce clean, solid castings, assuming of course that the mold is made properly and the metal is in a satisfactory condition. No gating system can overcome the handicap of burned metal or a dirty, wet, hard or otherwise improperly made mold.



Methods for gating small bushings molded two in a flask of which only one will give dependable results

In the method shown in Fig. 1 the first metal enters the mold at the bottom and forms a cushion for metal entering the top a few seconds later when the sprue is filled. Also at the conclusion of the pouring period the hottest metal flows in at the top and fills the shrink ball.

In the method shown in Fig. 2 all the metal enters the mold at the bottom. As a result the entire amount has to travel a maximum distance with constant risk of erosion and the trapping of sand particles or air bubbles. At the conclusion of the pouring period the coldest metal is at the top, thus defeating the natural law by which metal should solidify from the bottom upward and draw metal from the top to compensate for this shrinkage. The principal objection to the third method is that all the metal flows down in contact with the mold wall and there is an excellent possibility that it may wash some of the sand away in its descent.

Broderick & Bascom Rope Co., St. Louis, celebrated its sixtieth business anniversary in May.

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Industry Provides Social Advances

(*Continued from page* 23)

It was followed by a period in which great social advances were made, not as a gift, but as a human right and as an advance in industrial efficiency. The main spring behind this was competition. By compelling a better product, which in turn calls for more intelligence from managers and men, which in its turn commands a higher reward, competition lifted the level of productive life all round. Genuine competition always works for that sort of betterment. When competition doesn't work that way it is not competition. But very briefly it comes to this. Industry itself is the basic social reform. You can't put industry on one side as something contributing to society from without. It is society itself functioning from the inside. That is what forever prevents classes arising among us. Employers and employes are made of the same stuff. Society includes in one all its members, all its agencies. If I were to ask you men to rise who began to work in overalls, with no pull, with no capital but your hands and heads and the American urge to count for something in your generation, I dare say three-fourths of this audience would be on its feet. For that reason, when progress touches any one of us it becomes contagious and touches all. We can't confine it to any group. The so-called privileges of a so-called class soon become, under our system, the granted rights of all. But they are born and bred in private initiative.

Corporation Increases Progress

Carry this a little farther to the corporation, the greater industry that combines a number of trades and arts and sciences. I think there you will see the avenues of progress opened very much wider and more people thronging them. In the factory there was an improvement in industrial conditions, but with the corporation there came a lifting of the total social condition. Mass enterprise requires a high degree of mass intelligence. The lowest worker in mass enterprise is constantly in the presence of thousands of co-related ideas, with new ideas always awaiting his assimilation. Everyone's thought and effort, from the highest to the lowest, is geared to vast purposes scientifically achieved.

Now, this inevitably results in a higher grade social community all around. What particularly strikes me in our corporation is the fact that from top to bottom they are manned by mediocre men, by men who but for the corporation would have less important tasks to occupy them and would be confined to less useful places in the world. And this general lift of men is very widely spread. Business has such need for such varied knowledge in the commonest tasks that quite ordinary men by the thousands are raised much above the place to which their natural abilities in single play would have lifted them.

Students Learn Higher Trade

Look at our great universities with their 6000 and 12,000 enrollments: Students of chemistry, metallurgy, engineering, electrical science, business administration, and a score of related studies. What are they preparing for? Where can these boys from the villages and farms expect to use this technical knowledge they are acquiring? Where is its outlet? Every one of them is simply learning a higher trade which he expects to follow in some corporation. Otherwise, there would be no call for it. But the demand is now so high that it lifts the entire intellectual and social level with it. Of course, there are those who say this is pure materialism, but as I read life, the moral and spiritual use the material for their pedestal. The pages of mankind from poverty and material limitations is a preliminary step in progress towards spiritual manhood. Which leads me to repeat that industry is not merely a contributor to social progress from the outside, but is itself part of the inner progress that society is making.

None of these developments is the result of legislation or political suggestion. Congress never invented a bath tub, a tight roof, a washing machine, good roads, a rain-proof coat, an electric light, a forge, a family motor car, a new fabric, a plow, nor a single productive job in any branch of work. Now this fact is obvious and it ought to be acknowledged. The reason we are compelled to state it in almost the tone of special pleading is the propaganda which makes the inventive and productive energies of society the opponents of social progress and the politicians its only supporters. That view is the cause of most of our crooked thinking today.

And why is such a view held in official places? For no other reason than this, that experienced men have tried to curb the cruel and costly excesses of inexperienced men. Nothing is more costly than to delude with impossible promises any part of our population. Nothing is more costly than leading the country into wildernesses from which it must return in disillusionment and loss. The cost in public confidence, the cost in delays of progress is immeasurable.

Now, the great social objectives are shared by all citizens alike. They are part of the common idealism of Americans. We all have an ideal of the American family—self-reliant, self-supporting, enjoying economic security through employment, having a wide margin for the cultural life, thus raising the nation's status generation by generation. And every invention we make, every industry we establish is a stepping stone towards the realization of that ideal. But there are announced social objectives today that are not only artificial and undesirable, they are utterly impossible, because they spring from bad motives. They are fraught with injustice to the very people they are supposed to help. And they are destructive of social coherence.

Any plan that erects the illusion that plenty can be produced by scarcity, that money is more vital than the things we live by; any plan that makes self-reliance and individual industry not as necessary as they used to be for personal welfare; any plan that encourages business to rest from its initiative and sit back contentedly while its plants grow obsolete in a lotus dream of government price fixing, cannot be approved by experienced industry because such a plan destroys at one blow the very energies that would be required to make it work if it could be made to work. A man need not be an economist or statesman to know that. He need only consult that little fake detector which ticks valiently away in every honest breast.

Delays Social Objectives

Industry certainly knows by long discipline some of the laws of nature. And because it insists that a law of nature cannot be abrogated by an act of congress or an executive order, it has been stigmatized by short-sighted men as the antagonist of social progress.

Many a proper social objective is being doomed to unnecessary delay by the blundering methods used to achieve it. I would like to say to you, that not all the things we dream of today are impossible. I would be recreant to all that is within me were I to encourage a defeatist attitude in that or to give one calorie of comfort to any spirit of unconcern towards social progress.

Industry must be a science of human welfare as well as science of production. We can't evade the ethical and social element in our work. And the very fact that politicians blunder and get nowhere makes it all the more necessary for

industry to implement idealism in a way that will work. And we all know that the right thing always works. Experiments fail not from the opposition of entrenched greed and selfishness, but by their own inherent flaws. It is not enough to have good will, it is not enough to paint the rosy end of the wishful road, we must also know the right way, and the attempt of those who have bungled in the wrong way to turn the anger of their followers from themselves by branding industry as the marplot and charging the creative workers of America with inhumanity is the most antisocial thing that has occurred in this country for many a long year.

Social Problem Defined

How is the industry further to assist in making life what life was meant to be for the last family on the last street or the farthest acre in the land? Certainly not by neglecting its job and riding broomsticks in the realm of unreality; certainly not by ceasing to be producers and becoming professional reformers.

What causes what we call the social problem? It's all so simple we overlook it. It is only the lack of things that people need to live as people should that makes the social problem. I don't uphold the propaganda that we are a rich country, the richest country in the world, as we are fond of saying. It isn't true. And, worse than that, it's a stultifying fallacy. According to our standard of life there is not enough of anything in the country—no method of division can ever make it enough to give every family what it requires under our standard. And if our business men could get that fact into their minds, with all its implications, it would be like the dawning of a great light on this situation.

The key word of the social problem as it exists in America today is production. There is no use talking of distribution. All the distribution we ever had came from the pressure of production. Government has failed to start production; finance has equally failed; the industrial method of production and more production is all that remains to us now. And I would engage American industry in every branch to set up as its ideal the supply of all the needs of this country, and in that flow of supply, in that mountainous work of meeting the country's needs, most of our present problems would be swallowed up.

As far as most of us can see, price is the flood-gate to be opened to start the flow. It is a mistake to think that prices must be high for a people to be prosperous. The alliance of the politicians with the false philosophy of high prices for their own sake is the last evidence of the bankruptcy of the political mind. It is a mistake. It is a mistake to think that low prices mean low wages or inadequate profits. The entire history of American economic progress is comprised in this:—Commodities of ever-increasing quality, made accessible to more and more people by lower prices, permitting the building of better plants to make them, and commanding higher wages for all the people engaged in making them. That is the history—there is not a single exception. Everything we make is better, everything we make is less expensive, everyone who works gets more. The process has not failed. The depression is no argument against it. It has only not been carried far enough. Maker and seller and buyer and user all get higher profits out of this system.

A World of Work Ahead

But all this has come out of the sweat of American management and what I want to say tonight is that the sweating of the managerial brains of America is not over yet. The need for it was never greater. It is the sacrificial service required from management to lift the country over the stile. Industry must study to start the flow. In a measure it has started the flow. Enlarge that flow into a great river the streams whereof shall water the whole land. What a world of work—what a world of work awaits us in simply supplying the needs of our own people that have never yet been supplied! We have never seen real business in this country as yet! We have never seen real prosperity! The time is coming when the bitter struggle for business will be turned into a strenuous effort to get help enough to take care of the floods of business that will strain all our facilities. We shall need greatly expanded facilities, and the very best of them. There will be no talk about machines putting men out of employment 25 years from now. We will need the very best of all facilities just to give our people in this nation, the greatest market in the world, the greatest buyers in the world, a proper supply of the things of daily life. This is the working idea. I think our business men should hold before their minds every day the thought of a country, their own country, yet to be supplied with literally everything. And the men who have brought our supply up to its present high level, higher than any level in the world, are the only men I know who can lift it higher yet. They are on the job and they can handle it.

Let others talk, let others manipulate, let others think that business is speculation, that business is money. Our job as industrialists is to produce and to produce so much materials that production will flow; and this alone will sweep away many of the things that now most pressingly trouble us.

The Caterpillar Tractor Co., Peoria, Ill., is proud of Apprentice Wilbur Schuller, who won second place in the A.F.A. apprentice patternmaking contest at Detroit. Left to right—Byron Whittfoht, foundry and pattern shop instructor for the Caterpillar apprentice school; Wilbur Schuller showing his winning pattern; and K. P. Crowell, general superintendent of apprentice training

Establishes Credit Plan

Truscon Steel Co., Youngstown, O., has established a credit plan through the federal administration whereby the Equipment Acceptance Corp. will make advancements for repairs, alterations or improvement, insuring loans not to exceed $50,000.

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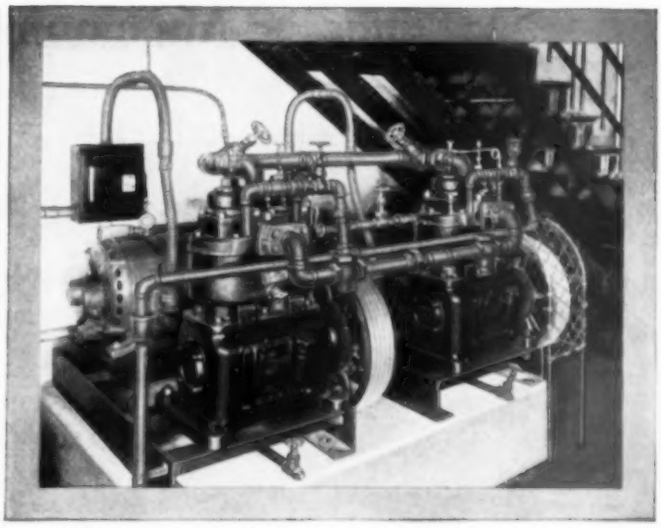

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I-BEAM CRANES and TROLLEYS

Founding Aluminum Bronze

(*Continued from page* 25)

As shown in Fig. 1, a specially designed gate is used. A sprue leads into a runner, part of which is in the cope, and part in the drag. The effectiveness of such a runner gate is shown in the illustration by the amount of dross that was caught in the cope. The horn gate is connected with this runner by a short gate cut in the drag only. An 8-inch cope is used and a 2-inch diameter riser is placed directly over the casting. To produce 2 balls having a combined weight of 9½ pounds in the machined condition, 32 pounds of metal are necessary. The risers on the ball castings are cut off about 2-inches from the top and the stem is used to hold the casting in the lathe in which it is being machined.

One Casting to a Mold

The molding procedure of the large ball, Fig. 5, is similar to that of the small one. Owing to its size and the extra large chills required, it was found best to cast only one casting in a mold. Here again, considerable experimenting was necessary to design chills with which good castings could be obtained.

A half chill, similar to that used on the small ball, was not sufficient to produce solid castings. Shrink holes were encountered at the bottom of the riser. A chill completely surrounding the ball then was used, with a small opening at the bottom for the gate and a large hole at the top for the riser. At first, the chill extended about an inch up the riser. The neck, meaning the section where the riser joins the casting, was chilled too much. This caused the casting to solidify there first, thereby separating the still liquid center of the ball from the feeding reservoir of the riser. The result was a shrink pipe on top of the machined casting. The deficiency finally was overcome by reducing the chilled section on the neck to about ½-inch.

The in-gate through the bottom of the chill also gave trouble. If made too long, it froze before the mold filled. If too narrow, it caused the inflowing metal to spout, and if too large, it drew back during the solidification and resulted in a drawhole on the finished casting. The gating, chilling and feeding as shown on Fig. 5 are the final and successful methods now used.

The most important part of casting good ball valves is the pouring technique. No matter how carefully the mold is made and how strictly all rules regarding chilling, preheating, etc. are observed, defective castings will be produced unless the proper pouring technique is followed.

The paramount rule is to maintain a steady stream of metal. It is to observe and control the even flow of metal by looking down into the riser. If the metal enters the mold from the bottom in a fountain-like stream, the casting will be defective. One single splutter is enough to cause sufficient dross to render the casting defective. Looking down upon the rising metal, its surface must be perfectly smooth with not a ripple on it.

It is evident that under these conditions strainer cores, "choking the sprue," or fast pouring must be avoided.

It is, no doubt, interesting to know that 33 pounds of metal are required to cast one ball weighing 11 pounds machined. This factor is well worth considering when estimating the cost of aluminum bronze castings.

The valve seats that go with the ball valves are shown in Figs. 2 and 3. Two reasons induced us to cast these parts as shown in the illustrations, with the valve seat proper face down; first to secure a flawless surface on the valve seat, and second, to facilitate the feeding of the casting with sufficient heavy risers.

Both patterns are parted in the middle. The drag half is formed by a dry sand core which also forms the ring gate and the four in-gates. These in-gates are really nothing but simplified small horn gates permitting the metal to rise uniformly at all four points.

Horn Gate Is Essential

The small seat, Fig. 2, is fed by a solid riser of practically the same diameter as the casting and the large seat, Fig. 3, is fed by two half round wedge risers. No chills are used on these two castings. The pouring technique is the same as that for the ball castings. Twenty-seven pounds of metal are required to produce one valve seat, Fig. 3, weighing 5¾-pounds machined.

The valve cover, Fig. 4, is the least difficult of all castings to make. Nevertheless, an ordinary gate, such as used for red brass, phosphor-bronze, or gun metal, would result in nothing but drossy and leaky castings.

A horn gate is essential to let the metal enter the mold cavity from the bottom with no turbulence whatsoever. A 3-inch diameter riser attached to one side of the casting will feed it during solidification. This riser must be placed close to the opening of the horn gate, otherwise a shrinkage will occur on the concave side of the casting. Tilting the mold with the riser side up will increase

(*Concluded on page* 84)

Practice Features

THIS interesting discussion of the practical phases of the founding of aluminum bronze for high pressure work is one of a series on various nonferrous alloys being presented through the American Foundrymen's association. This article is from a paper presented at the recent Detroit meeting of the association. The author is superintendent of the brass foundry, Goulds Pumps Inc., Seneca Falls, N. Y.

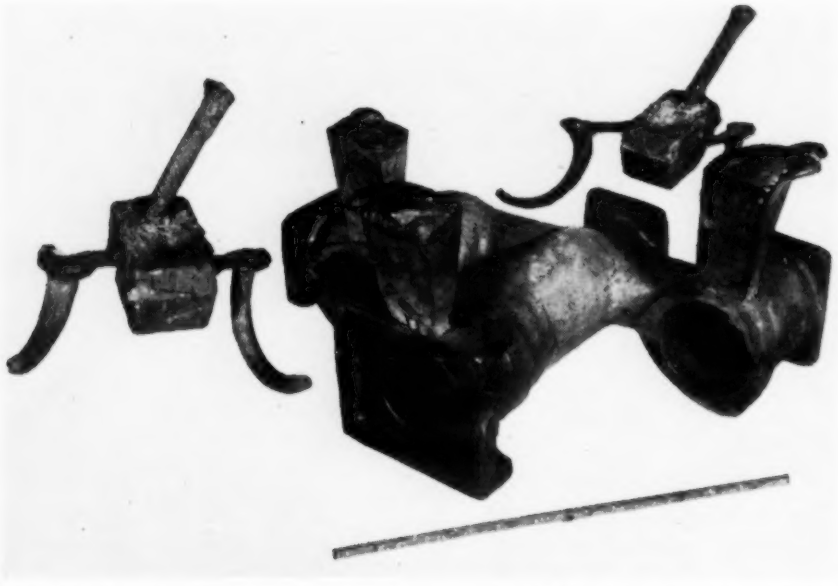

Fig. 7—Large cylinder casting showing gates and risers. Note dross in ponds

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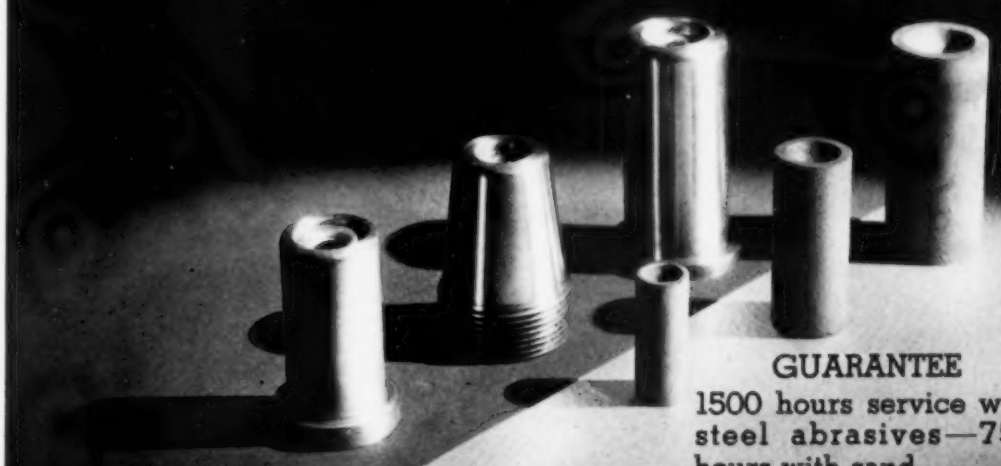

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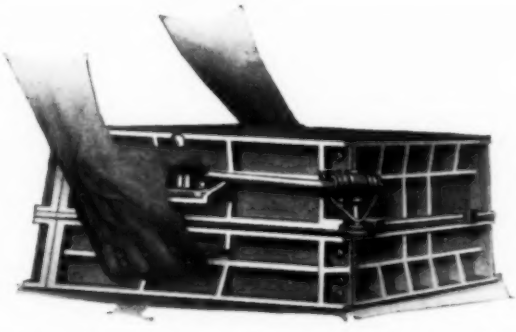

Illustration above shows the operator gripping the pin brackets on drag preparatory to lifting the complete flask of the mold.

It will be observed that the molder's thumb has depressed the sand strip lever and by so doing the sand strips have been withdrawn from sand back flush with inside walls of flask.

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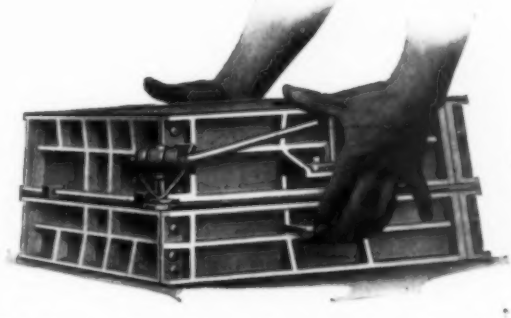

This illustration shows the operator releasing the sand strip lever just as flask is being replaced on machine to make another mold.

As soon as operator removes his thumbs the positive acting spring and lever arrangement automatically causes the sand strips to assume their proper positions to hold sand in flask.

From this it will be seen how the Peerless will speed up production without increasing the labor expense. Operation is easy; every action positive.

(*Concluded from page* 82)
the feeding capacity of the riser.

The casting is poured slowly with a steady stream of metal, holding the nozzle of the crucible as close to the sprue as possible.

The discharge manifold, Fig. 6, is composed of a comparatively light weight pipe to which are attached on one side an extremely thick disk-like flange and on the other side three heavy square flanges. This difference in wall thickness aggravates the existing tendency of aluminum bronze to crack and shrink in corners. Three good sized risers together with iron chills covering the entire flange sides and every rectangular corner were necessary to produce solid castings. These castings must be leakproof under a hydrostatic pressure of 2000 pounds per square inch.

To prevent dross from entering the mold, the metal is not, as in the previously mentioned cases, poured slowly but is choked through a specially designed gate.

Following is a description of the path the metal takes before it enters the mold cavity. An inclined sprue leads the metal directly into a pond in the joint of the mold. This pond breaks the force of the inflowing metal and is located with two-thirds in the drag and one-third in the cope. As the out-gates or branch-gates are considerably smaller in area than the sprue, the pond will fill up readily, with the dross floating to the top. Clean and quiet metal is drawn from the pond in a spigot-like fashion through the out-gates, running into the horn gates. Fig. 6 illustrates the whole gating method.

The horn gate is attached to the lowest part of the casting, in this case the round flange. As shown in the illustration, the connecting gate is considerably smaller in area than the sprue, enabling an easy choking of the metal in the sprue. On the other side, the narrow outlet of the horn gate is much larger in area than the connecting gate thus permitting the metal to enter the casting gently without a dross-forming sputter.

Data Are Valuable

All the data previously collected and experiences gained during the production of the smaller aluminum bronze castings were especially valuable when molding and pouring the cylinder casting shown in Fig. 7.

The rough cylinder casting weighs 160 pounds. After it is completely machined, it is tested under a hydrostatic pressure of 2000 pounds square inch. The average wall thickness is ½-inch with some heavy sections being 1½ to 2 inches thick.

As mentioned at the beginning of this article, the casting shown in the illustration is defective. It is rejected because of the gassed condition of the metal. It is interesting to see how the liberated gases caused the risers to swell. On one of them, the metal was actually forced to flow over the edge of the riser some time after the pouring had stopped.

To overcome the draws and shrink cracks, three large risers and 31 chills are used, of which 20 are in the core and 11 in the mold. The chills for the mold must be sandblasted thoroughly before they are rammed. The core chills can be used without being sandblasted as the heat in the core oven will drive off any moisture.

Care is taken to keep the molding sand on the dry side and avoid as much swabbing as possible. Lake sand of high permeability is used for the cores. As aluminum bronze does not cut in, blacking of the cores is not necessary.

Immediately before pouring, the mold is filled with carbon dioxide. The casting is poured two-up with four horn gates supplying the metal from the four lowest points. Here again, the metal flows through an inclined sprue first into a reservoir or pouring pond which is proportionately larger than the one used for the discharge manifold.

The horn gates are connected with the pond by small gates that must have a combined cross sectional area that is less than the area of the sprue. This arrangement will permit an easy choking of the sprue.

Mathematical Design Effective

Here is a practical example, the dimensions taken from the gates of the cylinder. The gate is 1¼-inches wide and 5/16-inch thick, having therefore, an area of 0.39 square inches or 0.78 square inches for both gates. The area of the 1¼-inches diameter sprue is 1.22 square inches. How effective such a mathematically designed gate and sprue arrangement is, can be seen best in the picture by the amount of dross retained in the cope side of the pond. The principle of this special gating is to prevent the metal being agitated after it has entered the mold. In this way the dross is kept to a minimum.

It is evident from the foregoing that aluminum bronze possesses peculiarities that distinguish it from ordinary nonferrous alloys and that, as a consequence, it is necessary to handle it differently from the ordinary gun metals and red brasses. The main difficulties to be anticipated are drossy metal, piping and shrinkage of heavy sections and draw cracks in the corners of re-entrant angles. However, any type and size of aluminum bronze castings can be cast successfully if made in accordance with well defined principles and certain precautions are adopted which may be summarized as follows:

The metal should be poured in a slow steady stream at the lowest pouring temperature at which a complete casting of any one design may be obtained with regularity; the molding sand should be on the "dry side" and be of a high permeability. The sand must be rammed uniformly around the pattern and any damp spots, caused for instance by excessive swabbing or patched up corners and lugs, must be avoided. If the metal simmers and fails to lie quietly at any point, it will foam and produce dross; all cast iron chills used in the cores as well as in the mold must be free from rust and scale, absolutely dry and in the latter case sufficiently pre-heated; the core sand should be very open, well vented and low in oil bond; the gate should be so arranged that the metal enters the mold at the lowest possible point or points and in a manner that will avoid the formation of ripples and spurting; heavy sections must be fed by proportionately large risers to eliminate shrinkage or chills must be used. In some designs a combination of both is effective; inner corners of re-entrant angles must be well filleted and chilled to avoid draw cracks.

Heat Treatment Discussed at Chicago

The Chicago Chapter of the American Foundrymen's association heard an interesting discussion on "Heat Treating of Steel Castings" by J. Houston, metallurgical engineer, Harnischfeger Corp., Milwaukee, at its May 18 meeting.

Mr. Houston presented data on the physical characteristics of various carbon and alloy steel castings, comparing the as-cast condition to that after heat treatment, the latter including a range of temperatures and quenching media. Slides were shown of a number of large steel castings employed in the building of power shovels.

The speaker pointed out that proper heat treatment will give good results only if the original casting has been made correctly and should not be considered as a cure-all for inferior foundry practice. In regard to the testing of castings, Mr. Houston stated that it is advisable to cast the test bar in close proximity to the section where failure is most likely to occur.

The following men have been nominated as officers of the Chicago chapter for the coming year, subject to election at the June meeting: L. J. Wise, Chicago Malleable Castings Co., chairman; H. W. Johnson, Greenlee Foundry Co., vice chairman; C. C. Kawin, Charles C. Kawin Co., treasurer, and E. M. Folman, Griffin Wheel Co., secretary. New directors include James Thomson, Continental Roll & Steel Foundry Co., C. O. Thieme, H. Kramer & Co., C. E. Westover, Burnside Steel Foundry Co., and W. C. Packard, National Engineering Co.

ADVERTISING PAGES REMOVED

How To Tin Gray Iron Castings

(*Concluded from page 27*)

shaker's tongs are cold. The reason for this is that it is almost impossible to use the same hot tongs for this part of the job as are used for the roughing pots. The hot tongs stick to the tinned surfaces.

Some operators dip the castings in cold water, between the roughing and finishing pots, but experience has shown this a waste of time.

After shaking, the castings are dipped in kerosene oil, then plunged into cold water, and finally laid away. The kerosene tub must be kept cool by a water jacket, and skimmed frequently.

For an extremely bright finish the castings are given light buff with a soft cloth wheel. Practically the same results are secured, at a lower cost by packing them fairly tightly in a wooden tumbling barrel with hardwood sawdust, and rolling them for about an hour.

It may be of interest to note that malleable iron castings respond readily to the foregoing process.

Steel pieces tin readily and do not require the preliminary milling and hydrofluoric acid pickle. It is obsolutely necessary to clean all grease or oil from the steel pieces by a cleaning solution. Approved practice includes putting the steel pieces through a cleaner, then a cold rinse, then boil them about 5 minutes in a dip tank containing 1 part muriatic acid to 50 parts water.

Use Wire Mesh Basket

Castings too small to be handled readily with tongs conveniently, may be tinned in wire mesh baskets of the type shown in the accompanying illustration. The basket should be of such size that the parts contained weigh not more than 15 to 18 pounds. The wire should roll outward over the top reinforcement. The handle should be about 40 inches long and preferably made of steel tubing, ¾-inch outside diameter and 1/16-inch wall. It should be braced strongly.

At first experience, operators may find the small pieces in the basket stick together. This trouble disappears as the operator becomes more experienced. The easiest remedy is to mix parts that are semispherical with flat pieces, or to keep special spherical pieces for the purpose. Quick shaking and dumping will remove most of the sticking trouble. Pieces with holes can be strung on wires and thus bundled, lowered into the pots, and shaken by the loop of the wire which should resemble a a hoop.

Retinning is a bugbear to most operators. The cheapest way out is to mill the castings over again, tin and all.

Another point is to get the freshly tinned work quickly away from the acid and steam. A moist atmosphere quickly will dull the finish. Some special jobs for shelf merchandise should be wrapped in wax paper immediately.

Castings kept under water too long will not tin readily. Forty-eight hours seem to be about the limit for safety.

High cost of tin makes it desirable to save all the dribbles from the edge of the pot and from the shaking. Tin consumption of course depends on the shape of the castings, but from 2 to 4 pounds per 100 pounds of cast iron is an average figure.

Tin dross can be sold for a good return. It will be found quite practical to melt down your own scrapings and sweepings. If the shaking is done over a sawdust box, put the caked sawdust into the melting pot. A black mass comes to the top which can be skimmed readily leaving nice bright tin.

Recover Tin from Splashes

Slightly more trouble will be experienced in recovering good tin from the splashes, and pot skimmings. Primitive methods in which the mass of slag-appearing material is piled on bars over a fire, will result only in disappointment.

Experience has shown that the dross must be melted down in a steel or cast iron pot, and tapped from the bottom as it melts. High temperatures are to be avoided. Keep flame away from direct contact with the tin.

Uniform practice is to cast this reclaimed tin in pigs 25 to 50 pounds weight. The tin room foreman who is keen to keep a bright finish, always uses this reclaimed material in conjunction with fresh new tin, and reserves that mixture for roughing pots. A spangled appearance in the castings need cause no worry as it comes infrequently from some unknown cause, and disappears on cooling.

In case of trouble where the tin does not adhere, but runs in little blobs on the surface, look to the cleaning and milling. Then check up on the flux used. Sometimes old operating men taking over shifts and finding this trouble, make it a rule to throw away all the flux in tubs, skim the pots, regulate temperature, and generally make a fresh start.

Given good conditions, the rate of production should be about 60 pounds of cast iron per man hour through all the processes. For tinning gangs upward of three men, a shift boss is desirable. A good man saves so much in power, fuel, tin and water, that he should get a higher rate. This also pins down the responsibility for quality of the product turned out.

Pittsburgh Group Hears Talk on Patterns

A lively discussion participated in by members present at the May meeting and dinner of the Pittsburgh Foundrymen's association followed the address, "Pattern Equipment for the Modern Foundry," delivered by Vaughan Reid, president, City Pattern Works, Detroit, May 18. Mr. Reid's address, which was illustrated with lantern slides, proved exceedingly interesting. Most of his subject was devoted to particular problems of pattern making for the foundry devoting its output to the automotive trade. One subject upon which Mr. Reid dwelt at some length was the manufacture of patterns for automobile engine blocks. Otto Nadolny, Duquesne Pattern & Bronze Co., Pittsburgh, was leader of the discussion which followed Mr. Reid's address.

The May meeting of the Pittsburgh association was the final scheduled meeting of the 1935-1936 season. The annual outing and golf tournament will be held at the Alcoma Country club, Pittsburgh, on Monday, June 15. This will be followed by a dinner, but there will be no speaker.

Officers for the 1936-1937 season were elected at the May meeting. Since no additional nominations for officers or executive committee had been received by Secretary C. H. Paul, the nominations as presented by the nominating committee of the Pittsburgh Foundrymen's association at its April meeting were formally acted upon.

Walter H. White, general superintendent of the Pittsburgh Rolls Corp., was therefore elected president of the Pittsburgh Foundrymen's association for the coming season. H. M. Wilson of the Taylor-Wilson Mfg. Co., McKees Rocks, Pa., was named vice president, and C. H. Paul, Mackintosh-Hemphill Co., Pittsburgh, was reappointed secretary and treasurer.

Mr. White in the presidency succeeds A. M. Ondreyco of the Meehanite Metal Corp., Pittsburgh. Mr. White had been vice president of the association in the 1935-1936 season.

J. S. McCormick Co., Pittsburgh, showed the entire exhibition it had at the American Foundrymen's association convention in Detroit, at the May meeting of the Pittsburgh association, and numerous favorable comments were heard.

General Brass Foundry Corp., 1364 West Randolph street, Chicago, has changed its name to Vlk Corp. Correspondent is William J. Cerny, 139 North Clark street, Chicago.

Molding Steel Turbine Casings

(*Continued from Page* 31)

short grids to support the larger grids as shown at *C*, Figs. 6, 11 and 12. Finally hooks or screws bolts *F*, Fig. 6, are employed to anchor or toggle the upper to the lower set.

Heads as shown at *D*, Fig. 5 are placed in position and long hooked gaggers are suspended from the upper grids to carry the overhanging sand,

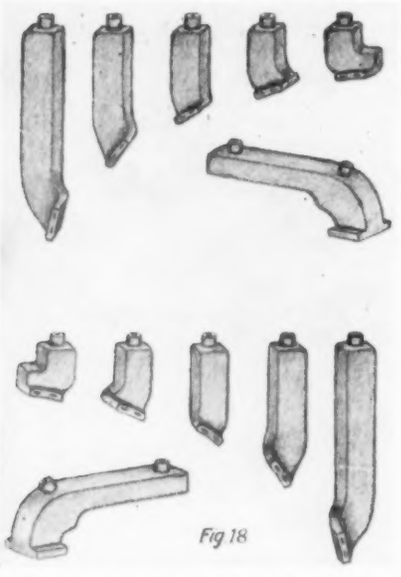

Fig. 18—Set of right and left port cores reinforced by the cage form of arbor shown in Fig. 17

etc., below. The sand is rammed through the spaces in the grids. Following this stage, other screwed hooks *E*, Fig. 6 are inserted as shown. Then the brick wall is built to the desired height to receive the top grids *F*, Figs. 11 and 12. Before these are placed in position, the feeding heads *D*, Figs. 5 and 6 are withdrawn from the sand. The surface of the cavity is painted after which a dome shape cover core is placed over each head opening. The top grids then are placed in position and screwed down. The drawbacks are completed by forming the joints as shown at *A*, Fig. 7 and *G*, Fig. 12.

Prodders Strengthen Sand

In the next step of the process the top grid *E*, Fig. 4 is placed in position. Long dabbers or prodders on the under side, supplemented by hooked gaggers of various lengths, strengthen and carry the mass of sand, etc., as shown at *G*, Fig. 5. Heads *E*, *F*, *G*, *H*, Fig. 9 are placed in this section to supply necessary feeding metal to the heavy belt section *C*, *F* and *E* of the casting, Fig. 5. The joint then is completed ready to receive the top part or cope as illustrated in Fig. 9. Time spent on carefully tapering and preparing the various joints is repaid amply later in assembling the mold.

To avoid the use of long gaggers, also to facilitate *easing* of the casting, grids are placed on the joint as shown at *K*, Fig. 5. The cope provided with cross bars *L*, is placed in position and the grids are attached to the bars by the hooks *M*. Sand then is rammed in the cope in the usual manner. Extra head allowance is provided by the addition of the head box *N*. The mold then is ready to be taken apart for the removal of the pattern.

After removing the head box, the top part of the pattern *A* is fastened to the cope which then is lifted off, turned over and finished as shown in Fig. 10. The various drawback joints are marked as shown at *D*, Fig. 9 and the center part of the pattern which makes up the steam chest is withdrawn from the mold. To facilitate removal of the center drawback *B*, a top plate is placed in position and attached to the grid hooks. The assembly is lifted and turned over for convenience in finishing, etc., as shown in Fig. 13.

The large end drawback *A*, Fig. 7 then is lifted away followed by the side drawbacks *A* and *B*, Fig. 8. The surface is finished and brackets cut as illustrated. These parts of the mold then are placed in the mold drying oven. With these various parts out of the way, the main pattern is lifted out of the sand. The bottom part of the mold is completed by cutting the bases for the heads as shown in Fig. 3. Two courses of brick are built up on the joint to support covering plates. This part of the mold is dried in position by coke fired portable heaters.

Corebox equipment and the arbor or grid for the main body core are shown in Fig. 14.The plate on which this core is built should be machined on the face, otherwise the core may not fit properly in the print. After the grid has been located in the corebox the mild steel rods *B* are bent to conform to the curve of the core. At regular intervals lateral rods are wired in place to complete the cage. The core is faced with about 2 inches of *compo* and 4 inches of backing sand. The remainder of the space is filled with cinders, old firebrick, etc., as shown in the sectional view Fig. 12.

Pieces of steel plate are placed in the prints *C*, Fig. 14 to form suitable bearings for the prints on the chamber cores shown in Fig. 18. After a sufficient amount of material has been rammed in the core frame, the correct shape is imparted to the face by the sweep or strike board *D*, Fig. 14. The remaining body core Fig. 15, also is made in the same manner. The other cores are made in the regular type corebox as shown in Fig. 16 which shows the corebox, grid and core for the chest end of the casting. In this a head piece is placed over the internal belt *A*.

Coreboxes for the various cores are shown in Fig. 17. The sand is reinforced by the wire cages shown. The coreboxes are constructed in a manner to permit making right and left cores by transposition of the bottom board *A* and the pieces *B* and *C*. A set of cores made in these boxes is shown in Fig. 18. Equipment for producing the large top chamber core is shown in Fig. 19. In this instance also, the round steel rods are bent to shape and further reinforced by lateral rods wired in place as described previously.

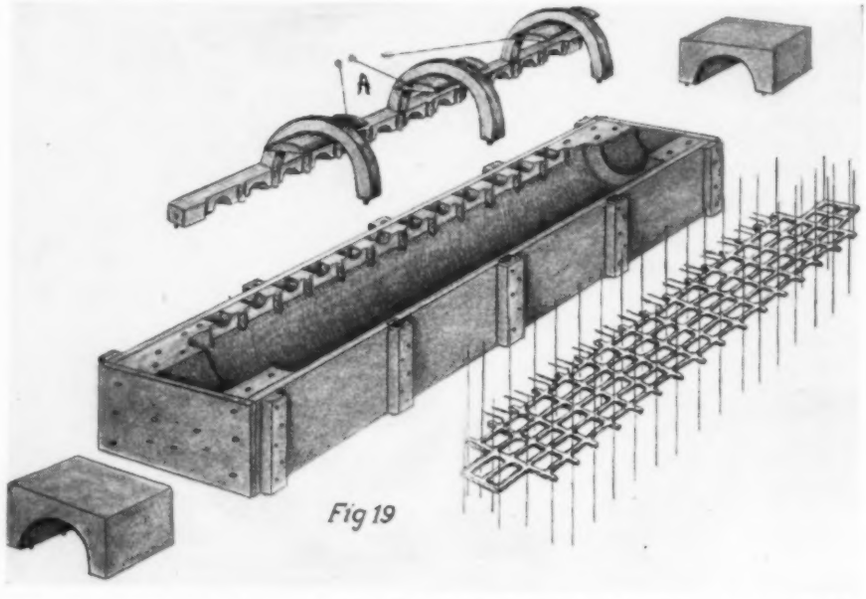

Fig. 19—Corebox and arbor for producing the top chamber core. The upright rods shown in the arbor as cast, later are bent to conform to the curve of the core

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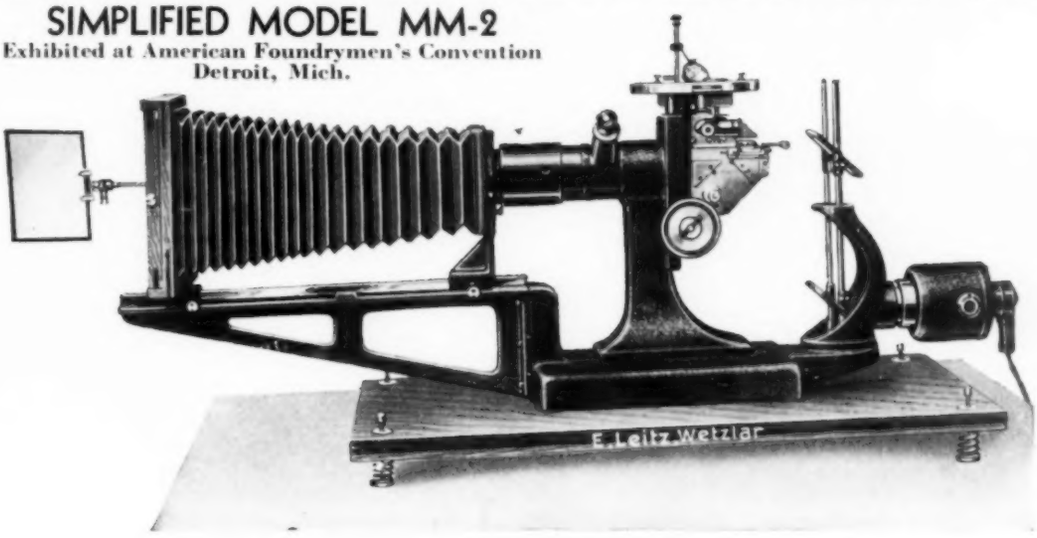

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Casts Bronze Parts for Pumps

(*Concluded from page* 33)

to the height of the available shelf in the oven. Pins are available in different lengths and in any given instance a set of pins is employed which will enable the top plate to just clear the cores on the plate immediately below.

The twin core ovens surmounted by a hood and shown in Fig. 5 take care of the output of five coremakers. The ovens are fired with gas and are so thoroughly insulated that the amount of gas required is exceptionally low. While the ovens are at a temperature of approximately 500 degrees Fahr. cores are placed on the shelves and removed at intermittent periods during the day. Shortly before quitting time the ovens are loaded with green cores. The gas is shut off and the heat in the ovens is sufficient to dry the cores thoroughly before morning. It is claimed that the cost of gas for 10 hours continuous operation of both ovens is less than $1.00.

Method and equipment for making tensile test bars are shown in Fig. 4. The pair of castings as they are shaken out, with sprue, runner, gates and side feeders are shown at the left. Drag half of a mold with the patterns in place is shown in the center. Patterns for the feeders rest on the drag face. This arrangement promotes feeding of the castings by gravity. The runner and gates as shown in the cope on the right also are in the cope part of the mold. Uniformly satisfactory results have been secured with this type of tensile test bar.

Meet Navy Specifications

United States navy specification 46M6c calls for minimum tensile strength of 40,000 pounds per square inch, minimum elongation of 20 per cent in 2 inches, from a composition containing: Copper 86-89 per cent; tin 8.00-11.00 per cent; zinc 1.00-3.00 per cent and impurities maximum 0.5 per cent. At the Northern Foundry company it is claimed that the test bars regularly show a tensile strength between 42,000 and 48,000 pounds per square inch. Elongation in 2 inches has been as high as 49 per cent and rarely drops below 34 per cent.

Incidentally the mold and casting shown in Fig. 4 are displayed on an improved type molder's bench developed and constructed by the company for its own use. It is substantially constructed, is practically indistructible and readily may be moved from place to place. The only parts really subjected to wear and abrasion are the slats on which the mold rests. These are protected by thin steel strips bent over at the ends and held in place with screws in countersunk holes.

Mold, cores and casting for one of the larger size pump cams or 4-lobe rotors are shown respectively in Figs. 2, 3 and 6. Eight of these castings recently were cast from the alloy referred to previously, United

Fig. 6—Showing arrangement of gates and feeding risers on 700-pound bronze rotor

States navy specification 46M6c, composition *G* bronze. After removing the gates and risers the lightest casting weighed 712 pounds and the heaviest weighed 717 pounds, a variation of only 5 pounds, a remarkable showing for heavy bronze castings made in green sand molds in wood flasks. The performance reflects creditably on the technical and mechanical skill of the molder. Also it indicates that the castings were fed adequately and properly to prevent shrinkage cavities and to promote uniform metal density. A pair of these cams form the impellers in a pump designed to revolve at 130 revolutions per minute while pumping petroleum at the rate of 3000 gallons per minute.

Method shown in the molding, gating and feeding of this casting represents a technique developed through a process of elimination over a period of many years. For example it will be noted in Fig. 6 that the sprue is staggered once to break the fall of the metal. The connecting runner between the first 6-inch drop and the remainder of the sprue leading to the bottom of the mold is smaller than either of the sprues and constitutes a *choke* whereby the sprue under the pouring cup may be kept filled. At one time the practice was to stagger the sprue in three steps from the top to the bottom, but later experiment indicated that this was not necessary. The two branch gates at the bottom gradually increase in size from the sprue to the casting. This prevents the metal from geysering or spouting into the mold. Spouting or high velocity metal has a tendency to produce scabs and frothy metal. Some of the frothy metal would enter the risers, but a certain amount would remain in the top of the casting, a spongy mass. Also the frothy metal in the risers would detract from the efficacy of the feeders.

Risers on each of the four upper points on the casting are designed to place most of metal in the riser above the casting. This arrangement provides all the benefits of a riser directly on top, without any of the disadvantages that may attach to a riser of that kind. The riser shown never pipes into the casting. It may be removed readily and as may be noted on the tops of the four risers shown in Fig. 6, it has performed its function adequately.

Change Gating Practice

In early experimental work a gate or passage was cut in the top of the cope connecting the top of the sprue with the top of the riser. This was done with the idea of getting hot metal into the riser. Later this practice was changed to the present method. The metal is poured from two crucibles at opposite sides of the mold and at a temperature between 1950 and 2000 degrees Fahr. Two small crucibles holding metal at a temperature of 2250 degrees are held in reserve. When the metal appears in the bottom of the risers, pouring from the large crucibles is discontinued and the hot metal from the smaller crucibles is poured directly into the risers until they are filled. The sloping base of the riser as shown in Fig. 2 is beter adapted to feeding than one that is cut flat, or one that actually is deeper at the outer end. The latter type of feeder actually may defeat its own object by drawing metal from the casting.

The vent holes shown on the joint of the mold in Fig. 2 constitute another important factor in securing a clean, solid casting. They provide a passage for the rapid escape of steam and gas generated when the mold is filled with molten metal. Unless this steam and gas can escape readily through the sand, a certain amount will enter the metal and set up a commotion that will create dross, dirt and blowholes in the casting. The lower part of the mold with cores in place is shown in Fig. 3. Dry sand ram-up cores are incorporated in the cope to insure a proper seating of the upright cores.

Northern Illinois Considers Foundry Losses

William Romanoff was the principal speaker at the regular meeting of the Northern Illinois Foundrymen's association, held May 12 at the Hilton hotel, Beloit, Wis. His subject was "Foundry Losses—Symptoms and Remedies."

A list of defects and their causes was given to the audience for reference during the speaker's talk. Mr. Romanoff discussed the different methods of sorting scrap, stating that iron was separated by magnet, borings were analyzed and mixtures refined after analysis by poling and pouring through a ladle giving a double bottom pouring effect.

The speaker considered impurities in metal mixtures and their effects, including iron, aluminum, antimony, silicon, silicon in the presence of lead, nickel, sulphur, and the effect of gases. Different types of furnaces and the effect on the metal was described.

C. A. Nass, vice president of the organization, presided at the meeting. It was announced that the annual picnic would be held at the Forest Hills country club, Rockford, Ill., on June 20 instead of June 6 as previously stated.

Collects Steel Castings Statistics

(*Concluded from page* 35)

when the present series was begun, are set forth in the accompanying table. The right-hand column indicates the industry's per cent of utilization of its productive facilities. Note that the industry did more than twice as much business in February this year as in the same month 2 years ago.

The society proposes in the near future to undertake the collection of separate statistical data covering carbon and alloy steel castings.

Book Review

How To Build Up Furnace Efficiency, by Jos. W. Hays, cloth, 599 pages, published by the Dunes Publishing Co., Michigan City, Ind., and supplied by THE FOUNDRY, Cleveland, for $3.00 and in Europe by the Penton Publishing Co. Ltd., London.

This is the eighteenth edition of this authoritative work, and represents a greatly enlarged discussion of the subject. The author has presented the discussion in a most practical way, thus providing a text of considerable value and interest not only to those who pay for fuel and those who burn it, but also to those dealing with the theory of combustion.

The new edition presents numerous charts, diagrams and illustrations which have been added to illustrate some of the things considered hard to explain fully in text. The author also has illustrated certain instruments and apparatus of his own design. Cartoons have been used effectively throughout the new edition to emphasize many of the arguments which the author has endeavored to make.

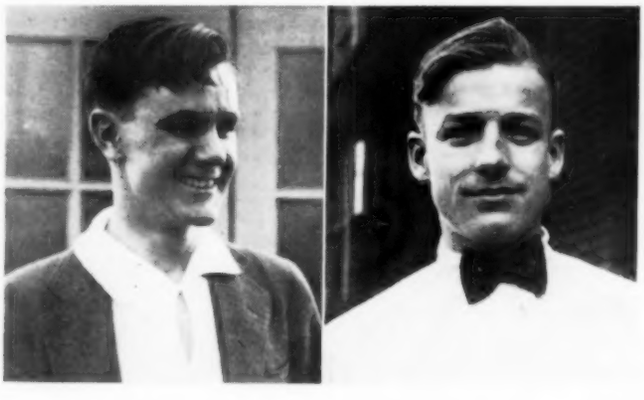
Among other things, the author has discussed the whys and wherefores for the wasting of fuel, methods of finding the points where fuel is being wasted, ways of stopping this waste, various types of fuels, such as oils, gases, powdered coal, etc. A domestic heating problem also is discussed.

New England Men Hear Talk on Cast Iron

Harold H. Judson, foundry superintendent of Gould's Pumps Inc., Seneca Falls, N. Y., delivered an interesting address on "Cast Iron for Pressure Work" at a well-attended meeting of the New England Foundrymen's association, held April 8 at the Engineers club, Boston. He explained the method employed by the company of making pressure tight cast iron by a two-cupola process. One cupola operates with a high percentage steel mixture and the other with a softer mixture, the two metals being combined in certain proportions in accordance with the type of casting to be poured.

The speaker pointed out the advantage of flexibility of the two-cupola method and stated that mixtures varied from 2.50 to 3.50 per cent total carbon and 1.50 to 2.10 per cent silicon. A study of hot and cold poured castings showed that the former was closer grained, freer from defects and stronger in every case than the same material poured slightly above the freezing point. Mr. Judson explained this briefly by showing charts of cooling curves. He favored the 2.50 per cent total carbon but stated that with this type of iron a more open sand and grain core was required.

The speaker further stated that a majority of his company's castings are of dry sand mixtures and hard-rammed, a feat which contributed to an explanation of the effect of the metal upon the precipitation of graphite, and facilitated the pouring of fairly heavy castings with low total carbon content without the use of risers.



TWO boys receiving instruction at the Cleveland Trade school won prizes in the A.F.A. Apprentice contest at Detroit. Edward Holy of the Aluminum Co. of America was awarded first in patternmaking, and Michael Kling, Lake City Malleable Co., received second in gray iron molding. Edward Holy is shown at the left above while Michael Kling is at the right. Edward Holy with his instructor, Frank C. Check, are shown in the illustration at the extreme right. The boys received their certificates and cash prizes at the May meeting of the Northeastern Chapter of the A.F.A., the presentation being made by Dan M. Avey, retiring president of the A.F.A.

Gray Cast Iron (*Chapter IX*)

(*Continued from page* 34)

experience the maintenance of an overly reducing condition is about as bad as the presence of an oxidizing atmosphere in the melting of high alloy irons. Melting under oxidizing conditions or the use of large percentages of oxides in the charge is dubious practice. At best there is a loss of expensive components. If the products of oxidation are not coalesced and slagged off, other troubles may crop up. Good slagging and hot metal are beneficial.

Nitrogen, carbon dioxide, and carbon monoxide, as encountered in cupola practice probably are without much direct effect, although both carbon dioxide and water vapor may result in oxidation, that is they will be reduced by the molten metal.

The questions of the influence of oxides of carbon on graphitization, as mentioned by Honda and Murakami—*Scientific Reports* of Tohoku Imperial university, 1921—of the relationship of the presence of oxygen to the *Acm* line as described by Harder, Weber and Jerabek—*Transactions* of the American Society for Steel Treating, 1928—etc. are beyond the scope of this chapter, interesting though they may be. However, it may be of interest to point out that Piwowarsky and others have noted that the permeability of solid iron to gases at high pressures is dependent on the lengths and thicknesses of the graphite flakes.

Pouring Temperature

In technical articles and books on foundry practice importance of proper pouring temperature is referred to frequently. Proper pouring temperature ranges have been worked out for a number of metals and it is quite common, in nonferrous foundries especially, to see pouring temperature controlled pyrometrically. In some cases this is done also in steel foundries and perhaps least often in iron foundries.

Without a doubt there is an ideal pouring temperature for a given cast iron job, but this depends on the nature of the iron and the characteristics of the mold. Consider the two extremes. Too hot iron will cause burning in of the sand, and the casting will cool somewhat more slowly and will not have the best grain structure. On the other hand, if the temperature is too low, the casting will not even run. Obviously, the happy medium is between these two extremes.

A glance at modern bronze foundry practice will illustrate the problem well. In the past, considerable bronze was gassed in melting. Old texts advised pouring the metal just hot enough to run the mold. In this way the casting cooled rapidly through the range where gases might be rejected, with consequent benefit to the metal. If poured too hot, puffed risers and unsound castings were likely. When metallurgists found how to produce metal that was freer from gases, they also found that higher pouring temperatures were in order. Within reason, somewhat higher temperatures permitted better feeding. Ultra hot pouring often resulted in liquidation, a result of going from one extreme to another.

In cast iron between extremes of cold and hot pouring several definite things are to be accomplished. One is to have the metal fluid enough to allow it to free itself from entrapped mold gases, another, to keep it fluid enough in the gating system so that the casting will be fed properly. Fluidity depends on composition and other properties inherent in the molten metal. Fluidity of a given iron is proportional to pouring temperature as is clearly shown by the formula—*Symposium on Cast Iron*, A.F.A.-A.S.T.M., 1933.

$$\text{Fluidity (for a given iron)} = \frac{\text{Pouring temperature—Freezing Point}}{\text{Freezing Point — Mold Temperature}}$$

The actual tem erature needed to produce ideal results is different with each job. Different foundries employ different gating. Although various investigators—particularly Dietert—have concluded from scientific study of gating that there is an ideal ratio of ingress gate to size of casting and other factors, nevertheless practices vary somewhat according to the nature of the work or other conditions peculiar to the particular foundry. Thus for the same job in different foundries, one condition may call for hot iron, another not so hot. Frequently a number of types of castings must be poured from the same iron.

The following concrete cases illustrate the importance of proper pouring temperature to soundness and strength. As shown in Table XII four ladles from different heats of the same type iron were used. Two bars were poured from each ladle, one hot (*A*) the other cold (*B*). In spite of the fact that the (*B*) bars ran full and appeared sound there is a marked difference in strength in each case.

Table XII

Effect of Hot And Cold Pouring

Ladle A—Hot

	Pouring Temperature Degree Fahr.	Strength, pounds per square inch
	2623	38,900
	2573	37,660
	2590	37,120
	2564	37,730
Average:	2570	37,880

Ladle B—Cold

	Pouring Temperature Degree Fahr.	Strength, pounds per square inch
1	2335	31,550
2	2355	34,670
3	2375	31,480
4	2291	30,680
Average:	2339	32,090

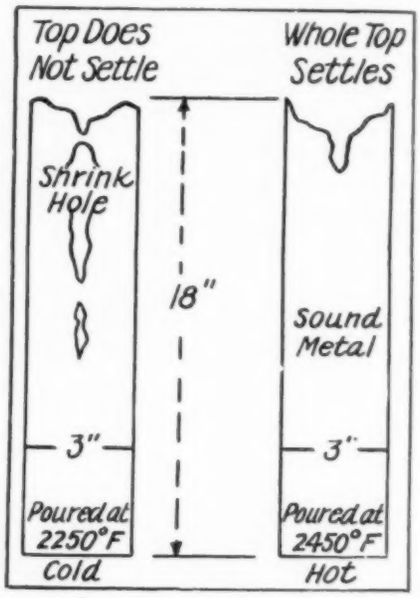


Fig. 106—Sketch showing the difference between hot and cold pouring of two similar bars, after sawing them in half

In another experiment two open end molds, each 3 inches in diameter, were filled with iron from the same ladle, Fig. 106. The bars then were sectioned lengthwise. A bar poured at 2450 degrees Fahr. was sound and dense whereas the one poured at 2250 degrees Fahr. had internal unsoundness extending over half the length of the bar. In the first case, the metal had incipient shrinkage, insufficient density, but no observable unsoundness; in the second, gross unsoundness.

Deep piping of a riser generally is a good omen. Risers are not effective unless they pipe, and many a riser has been fed by the casting. Improperly melted iron sometimes sinks down in the riser, then there is some liquation and pushing up of globules, of fluid metal from the bottom of the riser. This is a bad omen. Careful observation of pouring temperatures and resultant conditions in the risers and castings is a necessary practice in foundry art.

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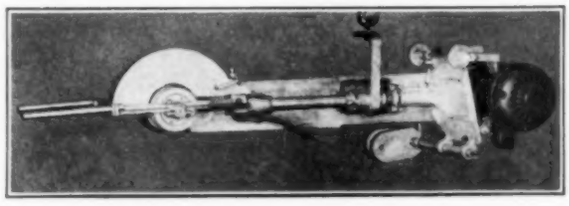

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Obituary

EMILE RAMAS, former president of the Association Technique de Fonderie, Paris, died recently. M. Ramas was managing director of Societe Francaise Metallurgique "Griffin" and professor at the high school of foundry in Paris. He was president of the Association Technique de Fonderie from 1918 to 1926 and was honorary president until March 21, 1935, when he was re-elected president.

♦ ♦ ♦

Edward R. McIntyre, foreman of the gray iron foundry, Chevrolet Motor Co., Saginaw, Mich., died May 9 in Flint, Mich.

♦ ♦ ♦

William B. Anderson, 80, president of the Buckeye Iron & Brass Works, Dayton, O., died May 27. Mr. Anderson had been with the foundry 60 years, having first started as a bookkeeper. He became president in 1917. A son, Robert C. Anderson, is vice president of the company.

♦ ♦ ♦

Charles J. Barnes, superintendent for 17 years of the Falcon Bronze Co., Youngstown, O., died May 11 in Youngstown. He formerly was employed by the United Engineering & Foundry Co. before going to the Falcon Bronze Co. and more recently was with Republic Steel Corp. He had resided in Youngstown most of his life.

♦ ♦ ♦

George Cooling, 75, founder and president of the Ace Foundry & Engineering Co., Jersey City, N. J., died recently at Irvington, N. J. He was born in England and had been affiliated with the foundry industry almost 50 years. Prior to his formation of the Ace Foundry & Engineering Co. four years ago, Mr. Cooling had been foundry foreman of the Eureka Fire Hose Co. for 23 years.

♦ ♦ ♦

Ralph Bartlett Goddard, 75, sculptor, who devoted many years of his career to the execution of bronze bas-relief portraits of noted men and to other art work, died recently in Middletown, N. Y. In his later years he made a specialty of portrait busts and was the creator of several bronze heroic statues, including a statue of Gutenberg which he created for Robert Hoe, printing press manufacturer of New York.

♦ ♦ ♦

J. Howard Martin, 66, general sales manager of Ellwood City Forge Co., Ellwood City, Pa., died at Pittsburgh, April 17. He was formerly associated with the Crucible Steel Co. of America and later organized the American Die Forge & Foundry Co., which ultimately was consolidated with Mackintosh-Hemphill Co. At the latter date he became affiliated with the Ellwood City concern.

♦ ♦ ♦

George H. Feltes, 57, president and treasurer of the Standard Electrical Tool Co., Cincinnati, died May 6 at French Lick Springs, Ind. He was born in Glendale, O. Mr. Feltes became an international figure and was a pioneer in the electrical tool industry. He entered the field in 1903 at which time he financed the organization of the United States Electrical Tool Co.,

George H. Feltes

acting as secretary, treasurer and sales manager from 1903 to 1925 when he retired from business. He re-entered active business in 1926 after acquiring control of the Standard Electrical Tool Co.

♦ ♦ ♦

Clement U. Lamboley, 49, vice president and superintendent, Brass Foundry Co., Peoria, Ill., died recently in Sturgis, Mich., of heart trouble.

Mr. Lamboley was taken ill while returning from the Detroit convention of the American Foundrymen's association, and was taken to the hospital in Sturgis. He was connected with the Brass Foundry Co. for 32 years.

♦ ♦ ♦

Samuel Austin, 85, chairman of the board of the Austin Co., Cleveland industrial contracting concern, died May 23 at his home in Willoughby, O. Mr. Austin had been in ill health for some time. He came to this country from England in 1872, obtaining work as a carpenter. A few years later he founded the Austin Co. which under his guidance built more than 5000 industrial plants in the United States and 21 foreign countries. The company booked contracts totaling $60,000,000 from Soviet Russia when that country started its five-year plan in 1929.

Metal Coatings Article Is Published

United States department of commerce, bureau of standards, Washington, discusses the corrosion-protective value during atmospheric exposure tests of electro-deposited zinc and cadmium coatings on steel, in a recent article. As conclusive results thus far have been obtained in only severe industrial locations, the report is subject to revision in the light of longer exposures or rural locations.

However, according to the introduction to this pamphlet, the source believes it improbable that this would change the practical application of the data. Diagrams, photographs and tables give results of tests and illustrate effects of various methods. The article may be obtained from the superintendent of documents, Washington, for 5 cents.

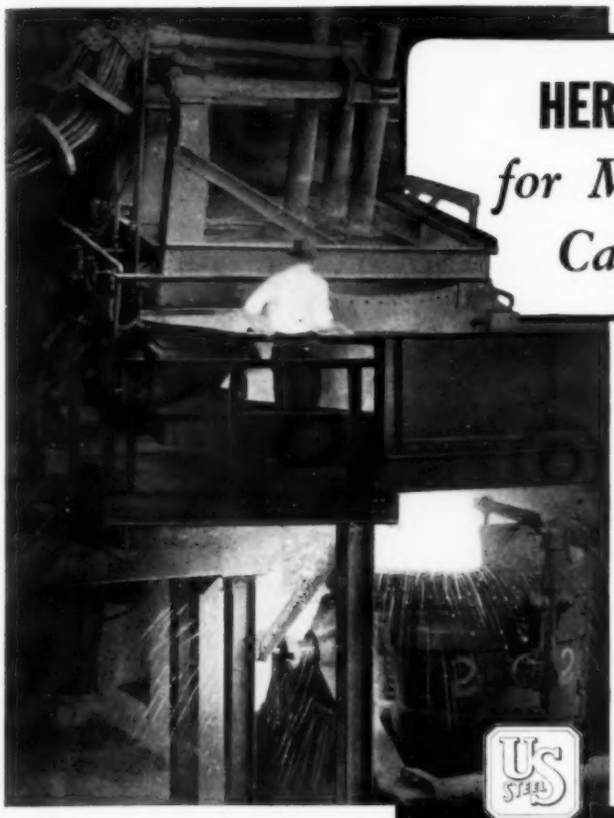
Book Review

Administration Proficiency in Business, by Erwin Haskell Schell, cloth, 292 pages, published by the McGraw-Hill Book Co., New York, and supplied by THE FOUNDRY, Cleveland, for $2.50 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

This work presents material of interest to two classes, namely individuals already tested in the technique of executive management who wish to advance to higher areas of service, and to younger business men wishing to prepare themselves for greater responsibilities.

The book is divided into seven sections. The first considers the attitude of the new administration toward the appointment, the predecessor and the new status in the organization; pointing to methods of avoiding common errors. The second section points to the need for the realization that the administrator's arbiter and director is a situation, a condition of affairs, rather than the guiding personality of a superior officer.

While administrative processes always resist standardization, the third section points to the fundamentals necessary in solving problems, making decisions and accomplishing results. Part four deals with the individuals and organizations the executive must represent. The fifth section reflects on some of the ways the major executive may place himself more closely in accord with those over whom he is to administer. The last two sections discuss continuity, tenure and progression in connection with the particular administration position occupied.



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NEW EQUIPMENT . . . . for foundries

Small Hoist Has Precision Ground Parts

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., has designed a new antifriction bearing hoist for industrial use, which incorporates single or variable speed push button control,

Load block and steel frame are fully enclosed

weight type limit switch operating through a contactor, heat treated gearing and external adjustment of mechanical load brake.

The load block and steel frame are enclosed and an integral motor shaft extension and driving pinion is used. Winding drum is splined to the main gear cage, anchorage is supplied by safety cable and the entire hoisting mechanism operates in an oil bath to insure lubrication.

Elevator Truck Lifts Work Vertically

Baker-Raulang Co., Cleveland, has begun production of two new series of streamlined elevating platform trucks of 4000 and 6000 pounds capacity for use in warehouses, shipping departments and foundries. Said to be especially valuable in core oven work, the vertical lift causes the legs of the racks to touch the floor simultaneously and vertically.

In the 6000-pound truck a chain type elevating unit is employed with the unit mounted high in the battery compartment enclosure. The 4000-pound truck utilizes a screw and nut type elevating unit mounted under the platform where it is accessible by raising the nose of the platform. Bumpers on these types have a pin-type coupler so the truck may be used to tow loaded trailers as well as transport skids. Standard platforms are 26¼ inches wide, 11 inches high and 55 inches long although platforms can be furnished up to 84 inches if required for special work.

Buffer And Polisher Employs 14 Wheel Heads

Packer Machine Co., Meriden, Conn., has developed a polishing and buffing machine embodying 14 wheel heads, ten of which are equipped with 10-horsepower motors and four with 7½-horsepower motors. Each wheel spindle is driven by multi V-belts. Thirty-eight work holding fixtures are mounted on the conveyor chain which is operated intermittently by an indexing mechanism. Center distances between work holding fixtures are 24 inches.

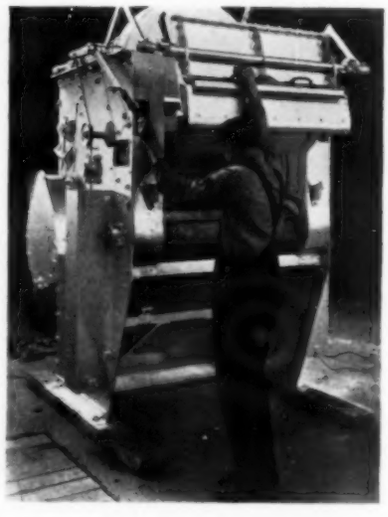
Designs New Acetylene Cylinder Manifold

Linde Air Products Co., 30 East Forty-second street, New York, has introduced a new wall type acetylene cylinder manifold. The manifold is available in a ten-cylinder unit to which extensions in units of five cylinders or ten cylinders can be made. The manifold consists of two high pressure header units. These feed into a central regulation system which delivers acetylene to the distribution piping system at pressures up to 15 pounds per square inch as desired.

The pressure on each header is indicated on high pressure acetylene gages located on the headers near the union connections to the regulator assembly. A low-pressure gage attached to the outlet of the hydraulic back-pressure valve indicates the delivery pressure to the shop piping system.

Gravity Feeds Abrasive in Blast Unit

A small tum-blast unit equipped with a wheelabrator and designed for use in foundries, shops and plants having a limited production, has been introduced by the American Foundry



Apron conveyor cascades the castings directly under the blasting area

Equipment Co., Mishawaka, Ind. Material to be cleaned is loaded directly on to the apron conveyor which cascades the individual castings under the blasting area when the mechanism is set in operation. In unloading, movement of the conveyor is reversed to allow cleaned products to spill into waiting receptacles under the machine.

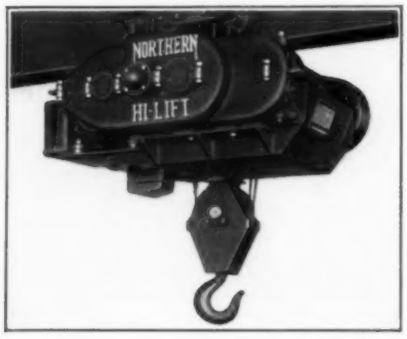
Centrifugal force is employed to direct the abrasive against the work to be cleaned in the unit, the abrasive being fed by gravity from an overhead storage bin. After blasting it drops through holes in the conveyor plates to a hopper below where refuse is screened out automatically. Cleaned abrasive drops into the boot of a bucket elevator and is lifted into an overhead hopper for reuse.

The unit, shown in the accompanying illustration, has an operating load capacity of five cubic feet, is 27 x 36 inches in size and is completely equipped with dust seals.

ADVERTISING PAGES REMOVED

Designs Electric Hoist for Small Space

Northern Engineering Works, Detroit, is introducing a line of high-lift electric hoists built especially to serve where heavy-duty is hampered by minimum space. The hoist frame, constructed of rolled steel



Gear case may be inspected without draining oil

shapes, forms a simple rigid structure. Hoist case is split horizontally through the bearings to allow inspection and removal of gearing and mechanical brake without removing the oil from the case. An automatic disk type mechanical load brake is provided in the hoist mechanism. An electric motor brake is provided on the hoist motor. The hoist is shown in the accompanying illustration.

Air Aftercooler Has Multipass Design

Sullivan Machinery Co., Michigan City, Ind., has introduced a multipass design in its compressed air aftercooler, shown in the accompanying

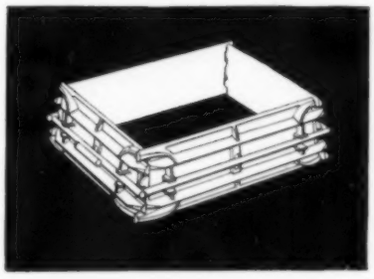
Water tubes may be cleaned without disturbing the air piping

illustration. This feature provides two passes of water for each pass of air. This together with small tubes, long air travel and directed air flow are said to insure maximum cooling with minimum water and space requirements without objectionable air or water pressure drop through the aftercooler. The unit is available in sizes to handle up to 9000 cubic feet of free air per minute. Water tubes are constructed of copper with steel tube sheets.

A centrifugal type separator for insuring the permanent removal of any condensed moisture or oil from the air is included in the aftercooler. It also is stated that a deflector prevents pounding and damage to cooler tubes by inlet air velocity. Water tubes may be cleaned inside and outside without disturbing the air piping.

Adjustable Jacket For Snap Flask Work

A new type adjustable jacket for snap flask work recently has been placed on the market by the Street Aluminum Jacket Co., Cleveland. The jacket, aluminum, iron or steel is made in three sizes, 4, 6 and 8



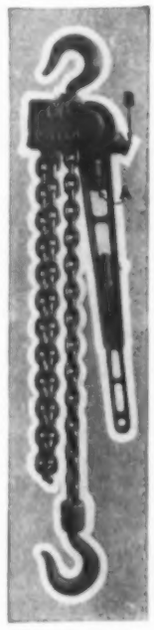
Sides are designed to be self aligning and self adjusting

inches high and the sides are interchangeable. It is claimed that the self aligning and self adjusting sides will follow any mold taper. Well reinforced lugs and a frame hold the sides together, yet permit quick and easy assembling or dismantling. The frame embodies a special tightening feature which locks all sides at a central point so that the pressure is distributed evenly. A net work of ribs has been designed which reduces warpage and strengthens the sides.

Self-Vulvanizing Rubber Co. Inc., Chicago, has developed a refined plastic rubber for coating, lining, and rebuilding surfaces of conveyor belts. The coating is said to have a shrinkage not exceeding 8½ per cent. At the first signs of wear belts may be re-surfaced completely without removal from the pulleys.

Utility Tool Has Numerous Applications

Chisholm-Moore Hoist Corp., Tonawanda, N. Y., recently has introduced the puller, shown in the accompanying illustration. This is a general utility tool for lifting or pulling vertically, horizontally, or at any angle. The unit is made in two capacities, namely ¾ and 1½ tons. A gear reduction in both capacities provides for a minimum amount of effort to operate the ratchet handle —43 pounds to pull ¾ ton. The ¾-ton capacity puller weighs 17 pounds, and the minimum distance between hooks is 9 inches. The handle is collapsible for tool box storage. It is claimed the double-duty alloy steel chain, with an ultimate strength of five times the capacity load, cannot kink or become bent or strained in handling or storage. Operation is controlled by two buttons which also permit quick adjustment of the chain. Mechanism and automatic friction brake are enclosed fully with no exposed bearings or springs and are packed in grease with no further lubrication required.



Electric Sander May Be Inspected in Use

Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago, has added a new portable electric sander to its line of electric tools. It may be used for sanding, grinding, smoothing wood surfaces and any other application involving the use of sandpaper or emery.

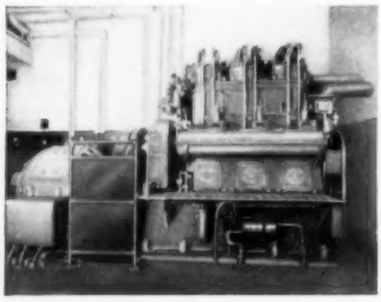
Armature and spindle of the unit

The handle may be used on either side of the machine

run in ball bearings and the alloy steel, heat treated gears of the mechanism may be taken apart for inspection or cleaning. Inspection of the motor can be made while the sander is running, by removal of the two brush covers.

Engine Uses Wide Range of Fuels

Chicago Pneumatic Tool Co., 6 East Forty-fourth street, New York, has introduced a diesel engine in which it is claimed the fuel required has been reduced and high compression makes possible complete, smooth, smokeless combustion with a wide range of fuels. The unit employs direct, solid injection of the fuel and the multi-hole type of injection nozzle used is simple; a complete nozzle consisting of only two parts, namely the nozzle valve and the nozzle body which is mounted in a holder.



The unit employs direct, solid injection of fuel

In the design of the cylinder, large water jackets, in which the flow is skillfully directed, are fitted with accessible cleanout openings. The valve cage pockets are located with a view to relieving casting strains and to afford a simple accessible arrangement. Inlet and exhaust valves are of forged alloy steel.

The base and crankshaft are of rugged construction, combining maximum strength with minimum weight. Main bearings are of the babbitt lined cylindrical shell type split in halves. Removable cylinder liners are cast of special nickel iron of a hardness for providing long wear. New piston design and new connecting rod design have resulted in effective balancing.

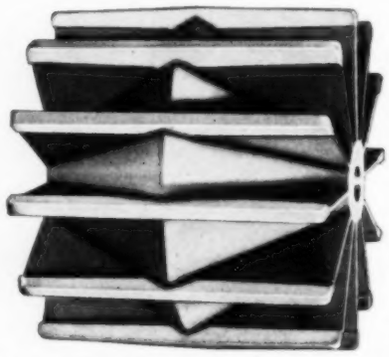
Vacuum Cleaner Has Variety Of Uses

Kent Co. Inc., Rome, N. Y., has introduced a new industrial vacuum cleaner employing a double fan, ¾-horsepower motor and a 1½-inch hose. The bag is double, being designed especially to separate all dust and dirt from the air before air passes through the fans, and is enclosed entirely in a steel can. This can rests on a base above the motor and fans, providing a unit of vertical design to conserve floor space.

The entire unit is mounted on two rubber-tired wire wheels and a swivel castor. It is propelled easily by a "T" handle. The machine separates into two parts with handles located for easy transportation. This machine is suited to a variety of industrial uses such as the cleaning of machinery, shelving and stock, the protection of workmen from objectionable dust, insurance against damage from dirt in processes, and the care of offices and equipment of all kinds.

Conveyor Pulley Is of Cone Construction

Sprout, Waldron & Co., 30 Waldron street, Muncy, Pa., has designed a wing type tail pulley for elevator and belt conveyor service. The cone type construction shown in the accompanying illustration, is said to make it impossible for any material that falls on the under side of the belt to come between the face of the pulley and the belt.



Wing type tail pulley is for elevator and belt conveyor service

This pulley is designed especially for use with elevators or conveying belts carrying sand, stones, sand, gravel, ashes, ore, and other hard products. The wings are smooth with rounded edges and are close enough to pull without any damage to the belt.

Floor Truck Has One Piece Steel Frame

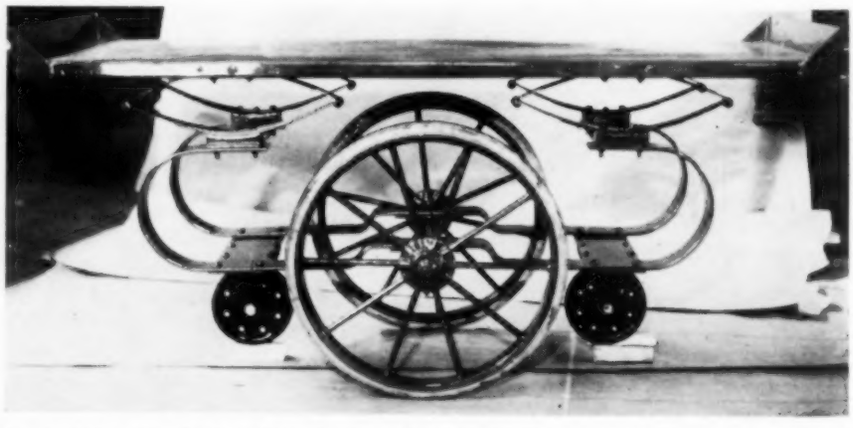
Lewis-Shepard Co., Boston, has introduced the floor truck shown in the accompanying illustration, features of which are a one piece steel frame, arc-welded throughout, flush hardwood tops which are steel bound all around, roller bearings on wheels and casters, and industrial balloon tires.

Hardwood tops are bound with steel on all sides

Core Transport Is Protected from Bumps

A core transport, incorporating new design features, has been developed by the Chicago Mfg. & Distributing Co., Chicago. The chassis is of resilient construction, made of heat-treated spring steel. Four elliptical springs are connected intermediately between the chassis and the table top. This design is said to absorb the bumps of gangways and thresholds before they reach the trays, practically eliminating chafed and broken cores.

Running gear is of sturdy design and is equipped with roller bearings with dust shield washers. Tilt wheels also are dust proof. The truck top is made of sheet steel and has 13 square feet of loading area. The top covers the entire running gear, protecting it from direct impacts.

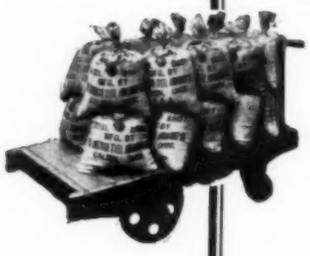


The springs are designed to absorb the bumps of gangways and thresholds before reaching the trays

Face the Facts and SWITCH TO STEEL

ECONOMY SAYS

"Switch to American Steel Abrasives"



BECAUSE FOR EQUIVALENT WORK YOUR COST WILL BE MUCH LESS WITH STEEL

You save on original cost of Abrasive
You save on Freight and unloading costs
You save on storage and handling
You save on disposal of waste
You eliminate abrasive dust.

AND THIS STEEL ABRASIVE DOES FASTER, BETTER WORK

Write for further facts, samples, prices.

Saves 99% on Abrasives Storage Space

This warehouse truck load of steel shot . . . 20 bags . . . 1 ton will do the same work as a carload of sand-blast sand at much less cost. Since it has 100 times the bulk, the sand will require 100 times as much storage space and over 100 times as much labor for handling and waste removal.

The American Steel Abrasives Co., Galion, O.

American "Standardized" Steel Shot

The shot is graded to sixteen standard sizes. It is extremely tough, hard and effective in its work. Its peaning hammer action removes scale rapidly leaving a clean all-metal surface.

American "Eversharp" Steel Grit

Graded to ten standard sizes, eversharp grit offers hard sharp edges which clean castings very rapidly leaving a smooth velvety surface that is especially fine for any type of coating such as enamel, paint or plating.

AMERICAN STANDARDIZED STEEL SHOT

THOSE WHO SWITCH TO STEEL ABRASIVES NEVER SWITCH BACK

SAND TESTING

Sand Testing is a Present Day Necessity.

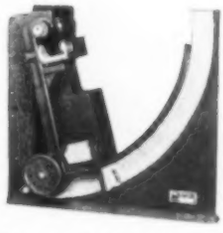
1. Enables purchasing sand better suited to your needs.
2. Enables mixing sand to best Moisture, Permeability, Green and Dry Strength.
3. Enables a reduction of sand variation from day to day.
4. Enables a reduction of casting loss.
5. Enables a reduction in casting cost.

Write for information on Sand Testing Equipment.

Moisture Teller

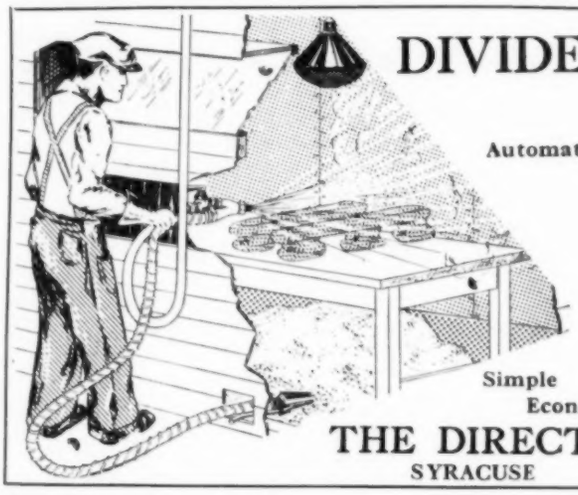
Sand Rammer

Permeability Meter



Universal Sand Strength Machine

Harry W. Dietert Co.-676 W. Grand Blvd.-Detroit, Mich.



DIVIDE AIR SEPARATORS

For removing oil and water from compressed air

Automatically Drained — Very Efficient

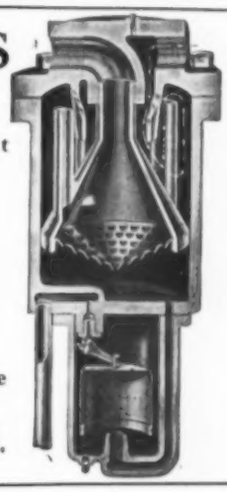
* * * *

CYCLONE BLASTERS

For cleaning Castings and Steel (use Sand, Grit or Shot)

Simple — Efficient — Inexpensive

Economical to operate — Results Guaranteed

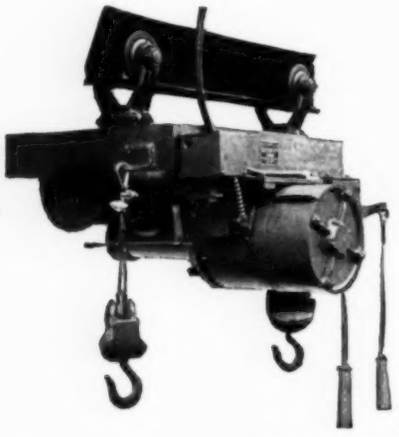


THE DIRECT SEPARATOR CO., INC.

SYRACUSE — NEW YORK

Electric Hoist Designed for Long Loads

Electro Lift Inc., 30 Church street, New York, recently has developed its new twin hook monorail electric hoist. Shown in the accompanying illustration, this hoist is built in capacities ranging from ¼ to 3 tons



Control may be operated by either rope or pushbutton

and is used wherever long and bulky loads are to be handled.

The hoist cables are carried on two drums spaced to suit requirements and operates from a single shaft from the worm geared hoist unit, all of which is carried on a welded steel frame. The worm drive runs on tapered roller bearings, fully enclosed within the gear case, and operates in a bath of oil to provide lubrication.

The control may be either rope type operated by pulling pendant cords or pushbutton type operated by a pushbutton station. It is said that the pushbutton control allows control of the load, by jogging, within a fraction of an inch.

Pyrometer Has Wide Recording Strip

Bristol Co., Waterbury, Conn., has introduced a wide-strip pyrometer, which is available in single-record, multiple-record, and recorder-controller types. This instrument, operating on the potentiometer principle of temperature measurement, has a built-in accuracy made possible through a simple measuring balancing, and recording mechanism for the temperature.

The pen movement is always proportional to the size of the galvanometer deflection, and the slide wire contact and recording pen are mounted on the same carriage which runs on four wheels over a substantial two-rail track. It is driven through engagement with a hardened steel pin by a stainless steel lead screw mounted on permanently lubricated ball bearings.

A summary of other features of this pyrometer includes: 12¼-inch recording chart; 1¼-inch indicating scale; heavy-duty galvanometer enclosed in dust-proof case; and a duplex slide wire mounted in such a position that the slide-wire contact and pen are placed integrally on the same carriage.

Reducers Available In Wide Range of Ratios

Simple, compact, accessible construction, offering great flexibility of driving arrangement is claimed for a new line of worm gear speed reducers recently developed by the Link-Belt Co., Philadelphia, and shown in the accompanying illustration.

These new reducers are available in a wide range of ratios and capacities, with single or double reduction and in horizontal and vertical types. All are provided with precision tapered roller bearings and automatic lubrication within dust proof gray iron housings.

The output shaft with chilled phosphor bronze worm wheel can be located above or below the worm shaft. A feature of the double reduction unit is the unitized attachment of primary reduction unit to the side of the final reduction housing. The name plate is stamped to indicate the ratio, input and output revolutions per minute, the input horsepower or output torque capacity and the service factor used in determining the rating.

The speed reducer is made in either vertical or horizontal style

Impact Resistance Features Goggle Lens

American Optical Co., Southbridge, Mass., has introduced a new goggle lens having great impact resistance. It is claimed the new lens secures its extra strength from the high curvature.

An indication of the impact resistance is proved in a test shown in the accompanying illustration. A

The ball was dropped from a distance of 10 feet

1-inch solid steel ball was dropped on the lens from a height of 10-feet and the photograph was taken at the moment of impact. Standard test for goggle lenses specifies a ⅝-inch steel ball dropped from a height of 39-inches.

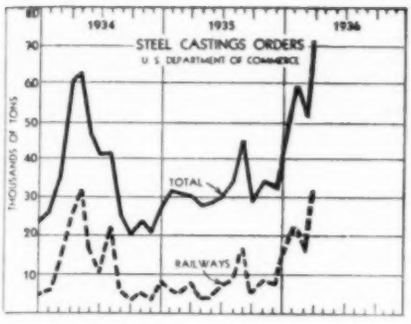
It is claimed that the new lens is effective in deflecting glancing blows, and also that the curvature permits a closer fitting to the face without interfering with the eyelashes.

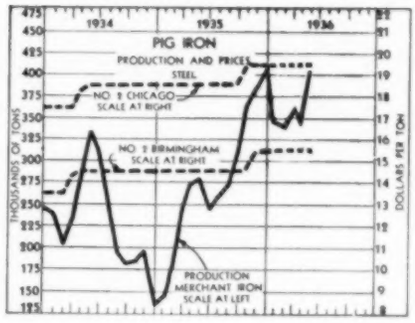
Sand, Gravel Aggregate

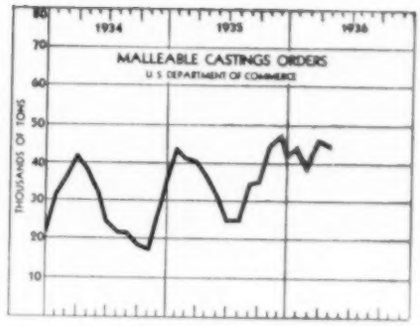
George F. Pettinos Inc., 1206 Locust street, Philadelphia, recently has developed a sand and gravel aggregate which is said to withstand the effect of high frequency current on foundation and construction work. It is claimed that the use of this aggregate in the construction of high power radio transmitting stations has eliminated the heating of foundations caused by induction. This is mainly due to the fact that induction is not set up by the high frequency current on the minute particles of magnetic material used in the foundation.

Delta-Star Electric Co., 2400 Block, Fulton street, Chicago, recently developed a heavy duty 7500-volt bus support to carry eight by ¼-inch copper bars, constituting the main bus of a large steel mill. A lower insulator mounts on a steel I-beam and a side supporting insulator mounts on a concrete wall.

ADVERTISING PAGES REMOVED







Foundry Activities

Reflect Industrial Trends

CLAFFEY CASTING CO., Waukesha, Wis., has combined its facilities and personnel with the General Malleable Corp., Waukesha. A larger modern gray iron unit will be ready for operation about Aug. 1 in the plant of the Werra Aluminum Corp., Waukesha, which recently was purchased by the General Malleable Corp. The gray iron division will continue to be known as the Claffey Casting Co. B. D. Claffey will be in active charge.

* * *

Texas Electric Steel Casting Co. Inc., Bringhurst and Gillespie streets, Houston, Tex., is erecting a 70 x 100-foot extension to its main building. The addition will increase capacity by 60 per cent.

* * *

Louisville Brass & Foundry Works, 1428 West Main street, Louisville, Ky., specializing in brass, bronze and aluminum castings, has begun operations. Frank Fleckenstein is president.

* * *

Ozark Foundry & Mfg. Co., Festus, Mo., has been incorporated by Alfred C. Boettcher and Albert J. Sertl. Amount of capital is set at $25,000.

* * *

John E. Berlenbach, for a number of years an official of the Bierman-Everett Foundry Co., Irvington, N. J., has leased the foundry property of the Quakertown Stove Works, Quakertown, Pa. Mr. Berlenbach will organize the Berlenbach Foundry Co., equip the plant with modern molding machines, cleaning equipment, etc. and operate a jobbing foundry. The lease was negotiated through Edward H. Zoll, Newark, N. J.

* * *

Pressure Castings Inc., Cleveland, has taken additional space in the former F. B. Stearns Motor Co. building, Euclid avenue and Lake View road, Cleveland. This is the company's third expansion of the year. David Ralls is president.

* * *

Construction is under way for a warehouse addition to the service parts manufacturing plant of the Chevrolet Motor Co. foundry, Saginaw, Mich. The addition will be built on Sixth and Washington avenues to increase storage quarters.

* * *

Index of foundry equipment orders, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 134.0 in April, 1936, as compared with 115.0 in March, 1936, and 113.2 in April, 1935. Index of shipments was 105.1 in April, 1936, 124.0 in March, 1936, and 69.7 in April, 1935.

* * *

Sonith Pattern Works, 38 South Cruse street, Indianapolis, has completed a casting pattern for a new type diesel engine to be used on the Fort Worth & Denver City railroad. Exclusive of the motor head and oil pan, the pattern is composed of 76 individual core boxes and 450 other loose pieces.

* * *

Foundry activity continued to increase in the Philadelphia Federal Reserve district according to reports received by the industrial research department of the University of Pennsylvania. Compared with the activity of last year, gray iron foundries showed gains of approximately 25 per cent in production, 20 per cent in shipments, but a decline of nearly 5 per cent in unfilled orders, while the steel foundries showed a gain of 133 per cent in each of these three items. In general the gain in activity was more pronounced in the gray iron foundries operating outside of Philadelphia than in those located within the city.

* * *

M. Wagner Inc., Glendale, Calif.,

RAW MATERIAL PRICES
June 3, 1936

Iron	
No. 2 foundry, Valley	$19.50
No. 2 Southern, Birmingham	15.50
No. 2 foundry, Chicago	19.50
No. 2 foundry, Buffalo	19.50
Basic, Buffalo	18.50
Basic, Valley	19.00
Malleable, Chicago	19.50
Malleable, Buffalo	20.00
Charcoal iron, furnace	22.00
Coke	
Connellsville beehive premium	$ 5.35 to $5.50
Wise county beehive coke	4.30 to 5.00
Detroit by-product coke	9.00
Scrap	
Heavy melting steel, Valley	$14.00 to $14.50
Heavy melting steel, Pitts.(dlv.)	14.00 to 14.50
Heavy melting steel, Chicago	12.50 to 13.00
Stove plate, Buffalo	11.25 to 11.50
Stove plate, Chicago	7.50 to 8.00
No. 1 cast, New York	9.00 to 9.25
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	14.00 to 14.50
No. 1 cast, Philadelphia	14.00
No. 1 cast, Birmingham	10.50 to 11.50
Car wheels, iron, Pittsburgh	14.00 to 14.50
Car wheels, iron, Chicago	13.25 to 13.75
Railroad malleable, Chicago	15.50 to 16.00
Malleable, Buffalo	16.00 to 16.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.50
Straits tin	42.87½
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary, standard)	16.50 to 17.00
Lead, New York	4.60
Antimony, New York	13.50
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.90

has erected a new plant for the production of permanent molds for hollow castings as applied to sanitary ware, soil pipe, kitchen ware, grinding balls, motor blocks, lock castings and other specialties. R. H. Mills is general manager.

* * *

Foundry schedules in the Chicago district held near the year's peak during May. Malleable plants reduced their production of automotive parts but were able to offset this to a degree by heavier demand from railroad shops and freight car builders. The latter situation also has aided operations of steel foundries. Output of farm implement and tractor foundries last month continued at the best rate in six or seven years. Other active sources of castings business were machine tool builders and sanitary ware producers.

NEW Trade Publications

DUST COLLECTORS—Claude B. Schneible Co., Chicago, has issued a new catalog describing the equipment of the multi-wash system for the suppression and collection of dirty air and noxious fumes in plants. Typical installations are described and dimensions listed for various sizes of units.

STEEL CASTINGS—Chicago Steel Foundry Co. has issued a descriptive leaflet covering special alloy and heat treated castings.

FLOODLIGHTS—Crouse-Hinds Co., Syracuse, N. Y., has issued a bulletin on its line of interchangeable floodlights, illustrating by photographs various installations and construction details.

WATER SYSTEMS — Roots-Connersville Blower Corp., Connersville, Ind., has issued a publication on its line of water systems for shallow wells and cisterns. Features of parts and sizes available are included.

WELDED STEEL TUBING—Steel & Tubes Inc., Cleveland, has published, through the Formed Steel Tube institute, a handbook of welded steel tubing involving highlights on its manufacture, selection of material, tolerances and methods of cutting, bending and tapering. Included are tables, specifications and tools to be used in the various processes.

BEARING UNITS—Link-Belt Co., Chicago, covers five distinct types of anti-friction bearing units in its publication. These types are available in streamlined pillow block, hanger, take up, flanged, duplex and special mountings.

LADLES—Whiting Corp., Harvey, Ill., combines a well-illustrated group of typical installations of foundry ladles with specific data such as standard sizes, uses and principles of design, in its most recent booklet on this subject.

HANDLING EQUIPMENT—Lewis-Shepard Co., Watertown, Mass., has issued a recent circular on its line of standard and special devices for handling material in various types of industry. A wide range of illustration is given.

COMPRESSORS — Pennsylvania Pump & Compressor Co., Easton, Pa., gives essential features, in a recent pamphlet, of its compressor designed for processing or manufacturing operations where the presence of lubricating oil in the compressed air would be detrimental. A sectional view and general description is given.

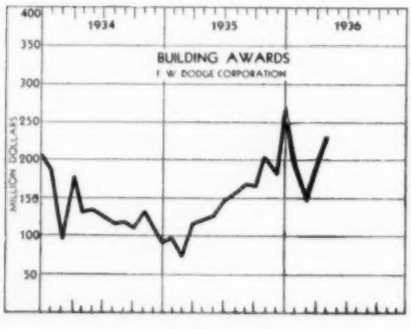
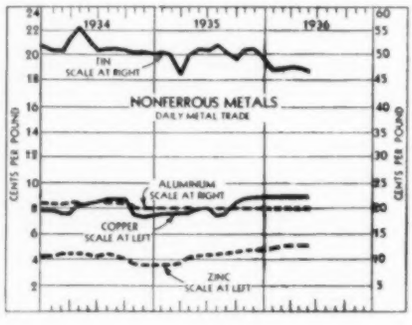
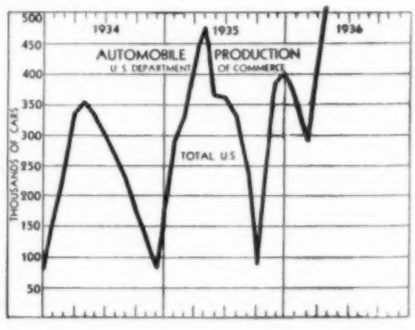
MEEHANITE—Fulton Foundry & Machine Co., Cleveland, has published numerous micrographs, concerning a study made by the Meehanite Research institute of combined carbon and graphite formation in cast iron, semisteel and meehanite. An interpretation of the structure of that material is given.

BEARING ALLOYS—Ajax Metal Co., Philadelphia, enumerates the four essentials of a bearing metal in its latest bulletin, namely compressive strength, adaptation, maintenance of an oil film and maximum life. Reasons for the application of these principles to the bull bearing alloys produced by the company are outlined.

PORTABLE CABLE—General Electric Co., Schenectady, N. Y., lists complete data concerning all types of tellurium all-rubber compound and braided types of portable cable for mining, welding and transit equipment, electric shovels and dredges and similar apparatus in a new edition on that subject.

MOLYBDENUM — Climax Molybdenum Co., New York, has summarized the metallurgical effects of molybdenum on cast iron in its recent booklet. Analysis, properties, and the effect of this alloy on the foundryman's production-economy problem are included, with statements in regard to the use of molybdenum in cast steel.

TRUCK AND TRAILER RESTRICTIONS—Four Wheel Drive Auto Co., Clintonville, Wis., has prepared through its research department, its 1936 edition of truck and trailer size and weight restrictions. Co-operation of responsible officials in each state, who have checked and approved the laws of their respective states, was secured in making up this booklet.

BLOWERS — Roots-Connersville Blower Corp., Connersville, Ind., devotes its latest bulletin to the application of rotary positive blowers in foundry cupola service. Discussion of the structural features of these blowers, with illustrations to show the operating principle, bearing construction, etc., is given. A table giving melting capacities, speeds and horsepower and data with reference to air ratios, heights of coke beds, etc., concludes the issue.

FOUNDRY EQUIPMENT—C. O. Bartlettt & Snow Co., 6200 Harvard avenue, Cleveland, has available for distribution a booklet descriptive of its line of foundry equipment. Eight pages are devoted to typical layouts for small, intermediate, special and continuous production foundries. Detailed description of the company's equipment follows, with illustrations and 26 engineering diagrams. Equipment includes shakeouts, sand cleaning, sand conditioning, seasoning bins, distributing systems, flask fillers, hoppers and gates, mold conveyors, dust collectors, skip hoists, etc.